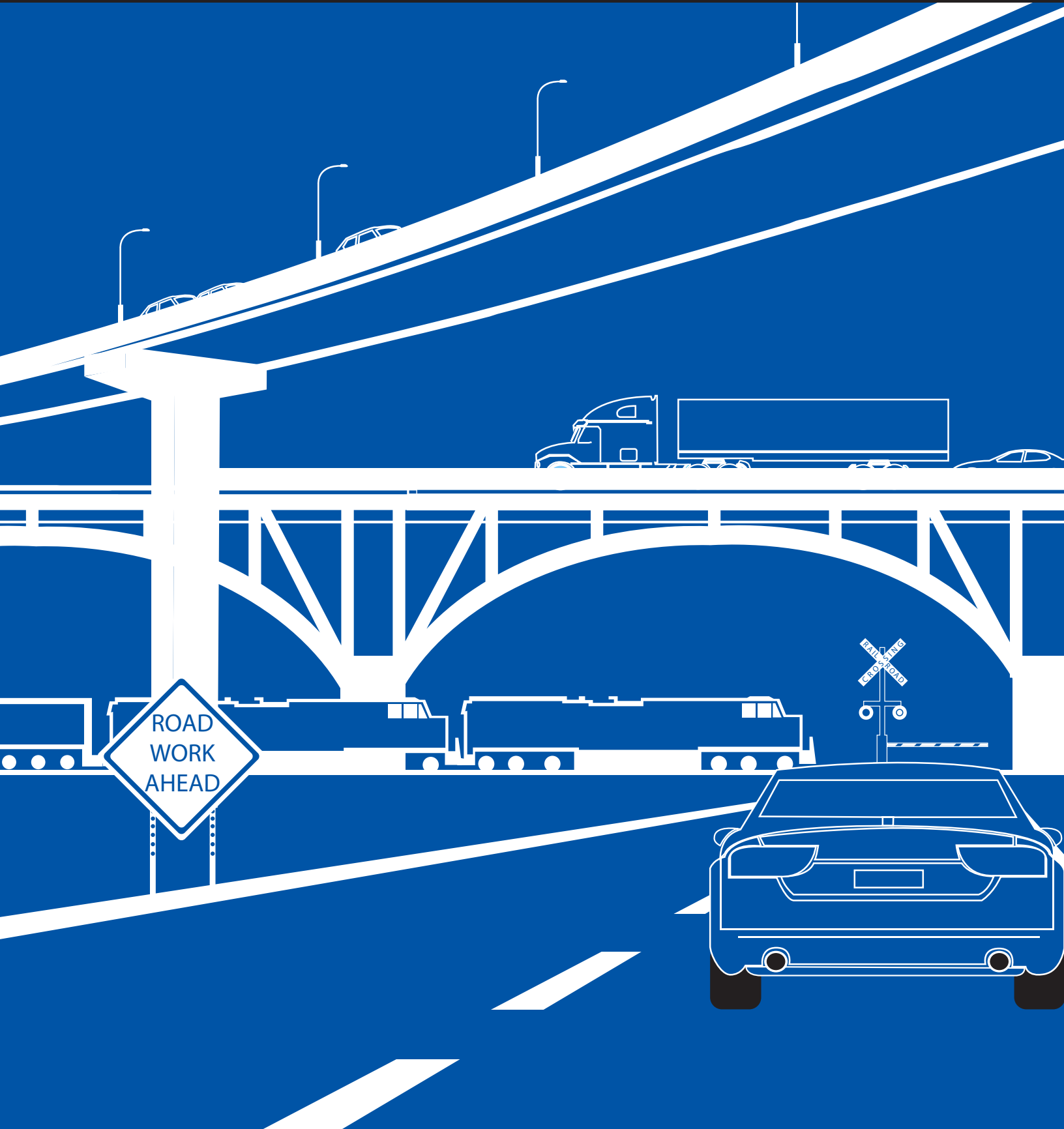




Critical Path for Project Development

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Kentucky Transportation Center
College of Engineering, University of Kentucky, Lexington, Kentucky

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Commonwealth of Kentucky

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Research Report
KTC-19-22/SPR17-547-1F

Critical Path for Project Development

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16. Abstract Overseeing the delivery of highway projects at the Kentucky Transportation Cabinet (KYTC) requires the successful coordination of activities and inputs from multiple external agencies and members of the agency's Project Development team, who have varied disciplinary backgrounds. Despite the complexity of project delivery, the Cabinet presently does not estimate hours and project milestone dates until after it has selected a design consultant. Moving forward KYTC should explore requiring consultants to develop a critical path method (CPM) schedule. To facilitate this process, this report describes a methodology for producing CPMs for design contracts/projects based on procedures outlined in <i>A Guide to the Project Management Body of Knowledge</i> . In addition to reviewing the CPM, this document includes critical path templates that are representative of the Cabinet's project design process. Templates were developed with the assistance of KYTC experts knowledgeable in areas such as project management, environmental processes, utilities, right of way, and highway design. Work-breakdown units, templates, and Gantt charts for three project contexts were developed: 1) Rural Federal Bridge Replacement (Categorical Exclusion I), 2) Urban Federal Bridge Replacement (Categorical Exclusion I), and 3) 4-Mile Rural Road Widening into Urban Intersection (Environmental Assessment, Finding of No Significant Impact). An in-depth glossary contains detailed explanations of work-breakdown units and flags issues and challenges that merit close attention during project development. With recourse to the tools and templates presented in this report, project managers and consultants can pursue project management in an organized manner and be ready to deal with any contingencies that may arise.				
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Executive Summary

Overseeing highway project delivery at the Kentucky Transportation Cabinet (KYTC) requires the successful coordination of activities and inputs from multiple external agencies as well as members of the Cabinet's Project Development team, who have varied disciplinary backgrounds. Despite the complexity of project delivery, the Cabinet does not estimate hours and project milestone dates until after it selects a design consultant. To alleviate challenges associated with this situation, KYTC should explore requiring consultants to develop a critical path method (CPM) schedule. In an effort to facilitate this process, this report describes a method for producing these schedules for design contracts/projects based on techniques from *A Guide to the Project Management Body of Knowledge*.

In addition to providing exhaustive discussions of the CPM, the report reviews academic literature related to the CPM. While little has been published on it in the context of the transportation industry, the method has gained in popularity throughout many industries because it helps project managers handle the complexities of scheduling and sequencing activities. Yet formal courses and training on the CPM remain inconsistent because no global – or national – standards for curricula have been developed. Nonetheless, training sessions can introduce attendees to the basics of CPM and its application.

Critical path templates that are representative of the Cabinet's project design process were prepared by the Kentucky Transportation Center (KTC) with the assistance of KYTC experts knowledgeable in areas such as project management, environmental processes, utilities, right of way, and highway design. Work-breakdown units, templates, and Gantt charts for three project contexts were devised: 1) Rural Federal Bridge Replacement (Categorical Exclusion I), 2) Urban Federal Bridge Replacement (Categorical Exclusion I), and 3) 4-Mile Rural Road Widening into Urban Intersection (Environmental Assessment, Finding of No Significant Impact). For each project context, work-breakdown units are described for alternative tracks: 1) when archaeology and asbestos issues emerge, and 2) when condemnation is necessary in the ROW. Underlying assumptions related to environmental issues, right of way, utilities, and railroads are provided in project descriptions. A glossary explains the work-breakdown units and underscores those issues that merit close attention during project development.

With recourse to the tools and templates presented in this report, project managers and consultants can pursue project management in an organized, orderly, and intuitive manner while being ready to negotiate any unexpected contingencies. For project management tools to remain effective throughout a project's duration, project managers and consultants must update schedules regularly as project development moves forward. Any events that influence original timelines should be incorporated into revised versions of CPM schedules and Gantt charts. While the materials presented in this report serve as a first attempt to grow the Cabinet's project management toolkit, future efforts in this area should focus on project time management training and the development of CPM schedules for additional project types and contexts.

1. Introduction

1.1 Study Overview

At the Kentucky Transportation Cabinet (KYTC) successful delivery of highway design projects entails the coordination of several disciplines within Project Development. KYTC project managers must ensure that District Office Branches, Central Office Divisions, the Federal Highways Administration (FHWA), and outside regulatory agencies engage with projects in a timely and responsive manner. Although project management is a complex task, currently estimated hours and project milestone dates are negotiated *after* the selection of a design consultant. And while estimates are prepared for critical milestones, no detailed schedule is developed to facilitate KYTC's management of the very limited resources it can access in the course of project delivery. As part of the negotiation process (or immediately following its conclusion), the Cabinet should require selected consultants to develop a critical path method (CPM) schedule. This report presents a CPM schedule similar to what is used on construction projects. With recourse to this schedule, project managers can better manage project resources and improve coordination across agencies, fostering the on-time delivery of highway projects to letting.

1.2 Research Objectives

Project objectives included:

- Develop a methodology to produce and use a CPM for design contracts/projects.
- Create several high-level CPM templates for typical design projects and common project phases.
- Develop a handbook for KYTC Project Managers that describe how to prepare and review design CPMs.

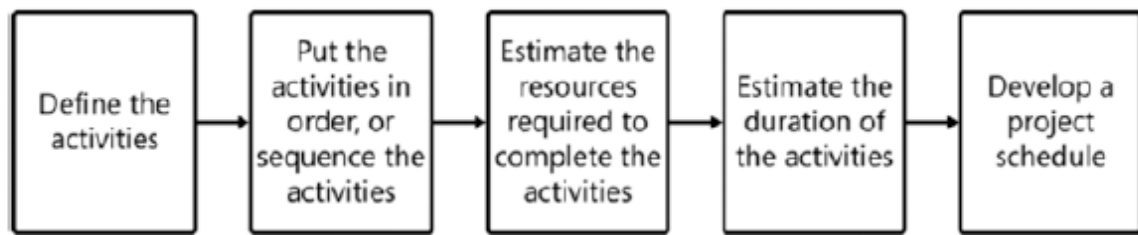
1.3 Structure of Report

Chapter 2 reviews CPM and salient literature. Chapter 3 discusses the production of CPM templates and links to templates created during this project and the glossary of key terms, which is included in its entirety as an Appendix. Finally, Chapter 4 details recommendations and key conclusions drawn from the project.

2. Background and Literature Review

2.1 Critical Path Background

Critical path is the path through a project that has the least duration and scheduling flexibility i.e. a lack of slack or float (Whitaker 2016). The CPM “focuses on identifying all paths through a project and, with the aid of a network diagram determining which of these paths presents the shortest duration and also the least amount of scheduling flexibility as indicated by the length of slack or float” (Whitaker 2016, p. 169). Critical path is a tool and technique used to develop a schedule. According to Greene and Stellman (2013), developing a schedule is vital to time management. It takes into consideration the various activities, durations, resources, and constraints facing the project manager and creates the project schedule.



(Whitaker 2016, Figure 4-1, p. 134) depicts the scheduling process.

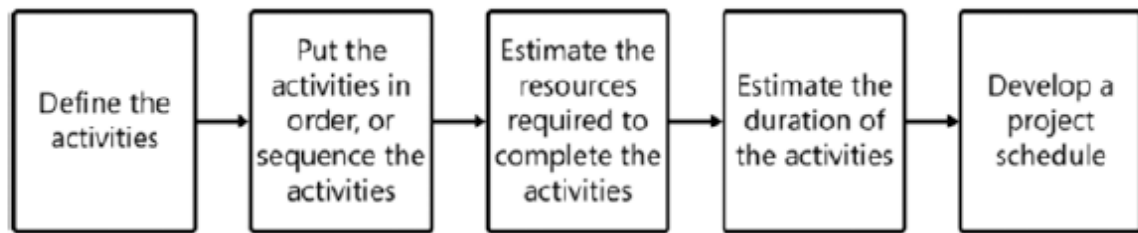


Figure 1 Scheduling Overview

The CPM is a schedule network analysis technique that project managers can use to calculate the early start, early finish, late start, and late finish dates for all project activities. Calculations are developed by using forward and backward pass analysis through the schedule network. A forward pass is described by Whitaker (2016, p. 172) as: “The forward pass is completed by working from left to right and calculating the early start and the early finish for each task”, while a backwards pass is to “work from right to left, and you calculate the late finish and the late start for each activity” (Whitaker 2016, p. 172). The amount of flexibility in a schedule is measured by total float, which is the amount of time that any activity can be delayed before impacting the completion date of the project. Thus, the critical path has zero total float. Free float is determined after total float and is the amount of time that an activity on the schedule can be delayed before impacting the next activity.

The CPM is an approach to identify all potential paths through the project and note the critical path and flexibility available from float. CPM requires the generation of a (Work Breakdown Structure (WBS), which is a “hierarchical graphical representation of the work to be done on the project, broken down to work package level” (Whitaker 2016, p.532). Durations and dependencies between activities must be determined and a network diagram built with forward and backward passes conducted; then the critical path of zero float can be identified.

Project managers can use a WBS to break up project deliverables into smaller components that are more easily managed and monitored; it shows the work needed to create the end product (Greene and Stellman 2013). *Work packages* sit at the lowest level of a WBS. They represent the lowest level into which activities can be decomposed and for which cost and duration can be estimated and managed. Decomposition is a technique used to break up the project scope and deliverables into smaller, more manageable components. Figure 2 is an example of a WBS.

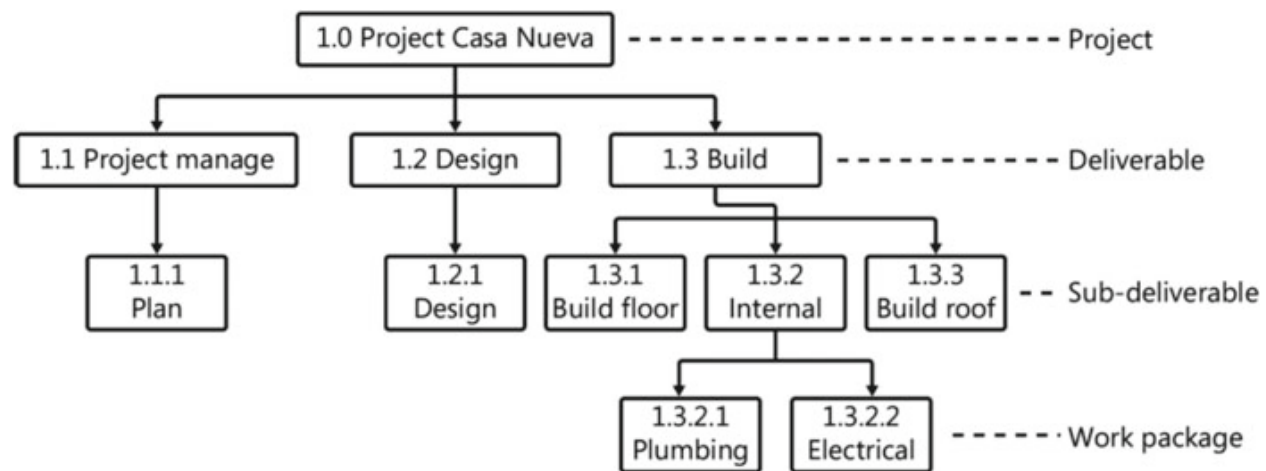


Figure 2 Work Breakdown Structure Example¹

To estimate durations, a project manager assigns some amount of time to each activity based on the resources they expect to be available. Several techniques are available to estimate activity durations. Expert judgment in combination with historical data from similar past projects can be used to estimate potential durations. With analogous estimating, historical data and parameters from earlier projects are used to estimate activity durations. This method can be helpful when project details are lacking; it is relatively cost-effective. However, analogous estimates may be less reliable than other, more complex methods. A more sophisticated approach is parametric estimating, which applies statistical analysis to historical data and project variables to estimate durations and other pertinent information (e.g., costs). Three-point estimating (i.e., program evaluation and review technique [PERT]) uses three estimates to help generate a range of possible durations for an activity. PERT uses three different scenarios: most likely, optimistic, and pessimistic.

Two formulas – the Triangular and Beta Distributions – are used to generate a single estimate based on the most likely, optimistic, and pessimistic cases:

- Triangular Distribution: Estimate= (optimistic + most likely + pessimistic)/3
- Beta Distribution: Estimate= (optimistic + (4*most likely) + pessimistic)/6

Group decision-making techniques, including brainstorming, Delphi², or nominal³ group techniques, can engage a wider audience and improve the accuracy of estimates by drawing on experience and collaborative analysis. Finally, reserve analysis can add reserves or buffers to activity duration estimates to accommodate

¹ Whitaker (2016), Figure 3-4, p.113

² Facilitated method to gather information anonymously from experts by sending questionnaires regarding project risks and evaluating the responses (Greene and Stellman 2013).

³ Defined by Greene and Stellman (2013, p. 181) as: “A form of brainstorming where you write down the ideas as you find them and have the group vote on which ones they like the best. You then use the votes to rank all of the ideas and separate the ones that aren’t important from the ones you want to delve into deeper.”

schedule uncertainty as well as the budget, estimated cost, or project funds. Contingency reserves are generally referred to as *known-unknowns* and can be a percentage of the activity duration, a fixed amount, or estimated quantitatively (e.g., through simulations). Known-unknowns are accepted and planned for as part of the schedule baseline, which is the version of a schedule approved to execute the project. It includes dependencies, durations, and other related information. Management reserves, or *unknown-unknowns*, are part of the overall project duration or budget held for management control to use on unforeseen work that still falls within the project scope. They are not included in the schedule baseline.

Dependencies are relationships between project activities indicating how activities are sequenced. The precedence diagramming method (PDM) is used to build a schedule model that depicts activity relationships with nodes and links and is also referred to as an activity-on-node diagram (Whitaker 2016, p. 145). The PDM makes allowances for four types of dependencies (Whitaker 2016, p. 146-147):

- **Finish-to-start (FS):** A relationship between activities in which a successor activity cannot start until a predecessor activity has finished.

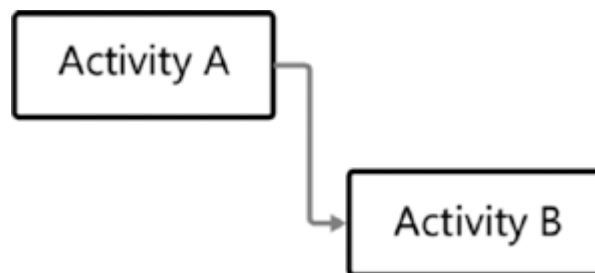


Figure 3 Finish-to-Start Relationship⁴

- **Finish-to-finish (FF):** A relationship between activities in which a successor activity cannot finish until a predecessor activity has finished.

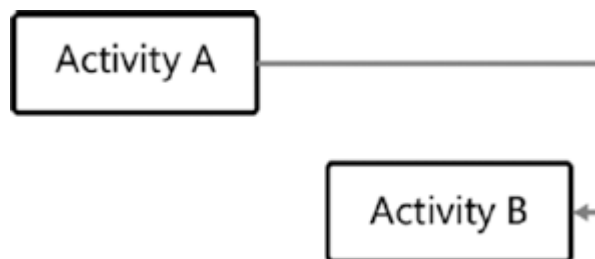


Figure 4 Finish-to-Finish Relationship⁵

- **Start-to-start (SS):** A relationship between activities in which a successor activity cannot start until a predecessor activity has started.

⁴ Whitaker (2016), Figure 4-3, p.146.

⁵ Whitaker (2016), Figure 4-4, p.146.

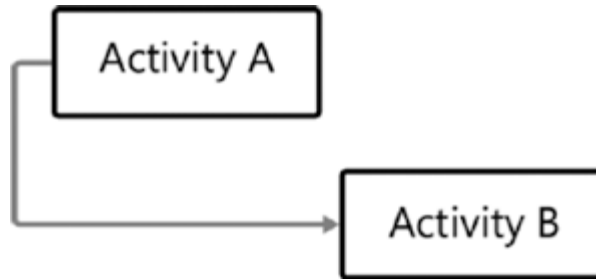


Figure 5 Start-to-Start Relationship⁶

- **Start-to-finish (SF):** A relationship between activities in which a successor activity cannot finish until a predecessor activity has started.

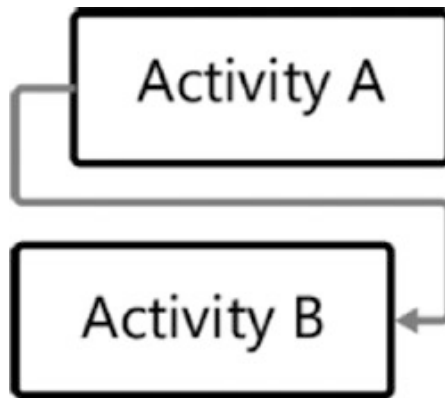


Figure 6 Start-to-Finish Relationship⁷

Dependencies may be characterized as either mandatory or discretionary and internal or external. Mandatory dependencies are contractual obligations or inherent to project work. Discretionary dependencies are tied to best practices when a certain sequence of activities is preferred. The project team can determine these. External dependencies are relationships between project activities and non-project activities. They lie outside of the project team's control (e.g., reliance on an external source for information). Internal dependencies fall under the team's control and involve a precedence relationship between project activities.

Leads and lags influence dependencies and durations as well. A lead is defined as “the amount of time a successor activity can start before its predecessor activity finishes.” (Whitaker 2016, p. 148), while a lag is “is the amount of time a successor activity must wait after its predecessor activity has finished before it can start” (Whitaker 2016, p. 148).

A graphical project schedule, such as Gantt Chart or bar chart, can be developed using information from the WBS as well as knowledge about durations, dependencies, and end points. Graphical schedules capture planned activities, including durations and dependencies. An example of a Gantt Chart is shown in Figure 7.

⁶ Whitaker (2016), Figure 4-5, p.146.

⁷ Whitaker (2016), Figure 4-6, p.147.

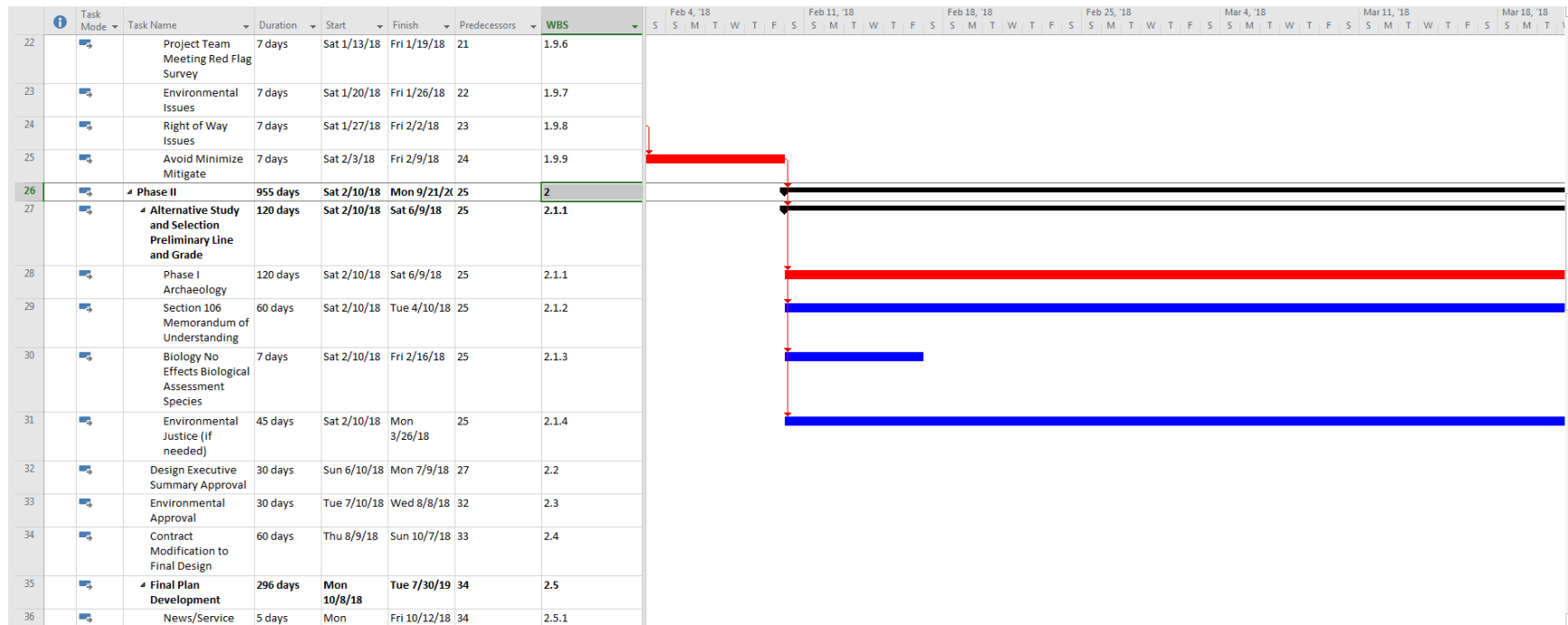


Figure 7 Gantt Chart Example

Project schedules often require adjustments when a change in resource availability occurs. Two resource optimization techniques can help project managers negotiate issues related to resource availability: resource leveling and resource smoothing. With resource leveling, the start and finish dates of activities are modified based on resource constraints. The goal is to balance the demand for resources with the supply. Resource leveling may alter the critical path. Conversely, the purpose of resource smoothing is to adjust activities to ensure that resource requirements do not exceed predefined limits. Smoothing does not change the critical path because activities can only be delayed if free or total float is available. Project managers also have recourse to two schedule compression techniques: crashing and fast tracking. The aim of schedule compression is to shorten the duration of activities to meet project needs and deadlines. Crashing shortens durations by adding resources such as overtime, however, it may increase risk and/or cost. With fast tracking, activities that would otherwise be performed sequentially are done in parallel (i.e., simultaneously), which may increase risk. This technique only works if activities can be overlapped.

2.2 Literature Review

Academic literature focused on application of the CPM in transportation contexts is scarce. Much of the literature that is available proposes alternative methods or changes to traditional critical path scheduling that has been tailored to meet the needs of certain industries. Our literature review focuses on applying CPM to construction projects and a previous effort undertaken in Kentucky to develop CPM training.

Fondahl's (1961) paper on manually applying the CPM to construction projects touts the method's ability to offer detailed project schedule information. Fondahl notes that the CPM provides information on project tasks whose durations dictate the overall project duration, the level of float non-critical tasks possess, economical scheduling options for all possible project completion dates, data for determining the best project completion date, and the ability to assess how changes in one task affect the overall project. Lu and Lam (2008) point toward increasing project complexity as a driver for CPM adoption in the construction industry.

Galloway (2006a) surveyed construction industry practitioners on the use of CPM. Respondents made a number of common observations, such as CPM has become a standard tool; the growing complexity of CPM often requires the assistance of specialists or experts; establishing standards and certification in use of CPM may be helpful, as would be best practices; and when CPM is taught in universities instructors should adopt a more standardized curriculum. Galloway (2006b) also surveyed universities regarding how CPM is taught. This survey suggested that 1) universities privileged theory to the detriment of applying teaching students how to apply CPM; 2) U.S. universities have more comprehensive curricula than universities in Europe and Asia; 3) curricula and textbooks are inconsistent, leading to varying levels of knowledge; and 4) the need exists for global standards.

Wallwork (2002, p. 13) discusses standards for a CPM schedule.

An acceptable standard for a [CPM] schedule is a schedule that includes activity items for all contract work items, including all contract milestones, contract stipulated work sequences, procurements, submittals and approvals, delivery, installation, testing, and, where applicable, training, submission of operations, and maintenance manuals.

To be useful, the CPM must contain a baseline schedule that indicates the scope of work and the plan for performing the work. It should be updated at least once per month, record start and finish dates as they occur, and document the percentage of work completed for each ongoing task (Wallwork 2002). Korman and Daniels (2003) list some problems that have arisen with CPM, particularly with software packages enabling less experienced individuals to develop flawed schedules. Challenges include adding excessive leads and lags to tasks, the use of multiple calendars on projects, and overriding resource constraints.

Hancher et al. (1997) first explored applying CPM at the Cabinet. At the time of the research, use of CPM was uncommon and typically reserved for complex, time-sensitive projects. Because adopting CPM often resulted in confusion, Hancher et al. observed that both contractors and KYTC project managers required better knowledge of the method. Surveys of other state departments of transportation (DOTs) at the time indicated that criteria for using CPM generally depended on temporal constraints, project complexity, and project dollar amount. A training was developed on CPM and included several facets of project management as well as specific examples:

The seminar content included the following topics: the development of basic concepts of project scheduling; bar chart schedules; critical path methods; conceptual scheduling; “I-J” (activity-on-arrow) and precedence CPM logic diagrams; time calculations; calculations of activity starts, finishes, and floats; reading of the CPM diagram; CPM calendar to day conversion; and identifying the critical path (Hancher et al. 1997, p. 7).

Four training sessions were offered to introduce attendees to CPM and help them develop knowledge of its use and familiarize them with its ability to improve project management.

KTC’s review of the CPM and the literature established a foundation for developing several design templates (see Chapter 3). Reviewing introductory material related to CPM is critical for developing trainings on its use and creating templates to improve project development. Templates in the next chapter illustrates the process by which projects are developed: from initial scoping to final plan development.

3. Critical Path Templates

3.1 Template Process Development

Working with KYTC subject matter experts KTC developed several critical path templates to illustrate the KYTC project design process. Templates visualizing project workflows were developed and entered into Microsoft Project, enabling the use of Gantt Charts. The entries in an accompanying glossary define each step in the project workflow including potential Red Flags, which denote potential delays along the critical path (see Chapter 4). Glossary entries were prepared by reviewing and synthesizing the relevant content of KYTC policy manuals.

To develop critical path schedules for each project type, KTC initially met in facilitated sessions with KYTC experts from a range of disciplinary backgrounds. KTC consulted with experts having knowledge of project management, environmental processes, utilities location, right-of-way (ROW), and highway design. Participants in facilitated sessions were split into two working groups and asked to respond to the following workshop question; “What are the steps needed to develop a project from funding authorization to letting?” Project management experts focused on higher-level steps on the critical path, while those with expertise in the environmental processes, utilities, and ROW concentrated on developing aspects of the critical path related to their disciplinary focus.

After brainstorming individually and engaging in group discussions, participants wrote each step on half sheets of paper and posted them at the front of the room so that all attendees could view their ideas. The KTC session facilitator helped organize each step in a chronological flowchart, capturing each activity required for project delivery. Once project activities had been identified, groups reviewed their work and began to integrate dependencies. Adjustments were made to more accurately reflect project workflows. Multiple quality control checks were used to ensure that the proposed dependencies were reasonable. KYTC staff members who did not participate in facilitated sessions reviewed the activity flowcharts as did several private sector consultants.

Creating accurate project flowchart and Gantt chart templates required the working group to identify a reference point to serve as a foundation for work-breakdown units and dependencies. Three project contexts were created so the Study Advisory Committee could accurately assign work-breakdown units: 1) Rural Federal Bridge Replacement CE I, 2) Urban Federal Bridge Replacement CE I, and 3) 4 Mile Rural Road Widening into Urban Intersection EA FONSI. The assumptions underlying each project context are detailed below, including those related to environmental, ROW, utilities, and railroad.

Rural Federal Bridge Replacement CE I

- Standard Rural Bridge Replacement
- Environmental (CE I)
 - Track for Archeology and not
 - Track for Asbestos and not
- Right of Way
 - 4 to 6 parcels, some appraisals, some MARs, no relocations, a miscellaneous move (i.e., barn)
 - Two paths tracked: Acceptance and Condemnation
- Utilities Overhead and In-ground
- A few overhead poles, underground water line

Urban Federal Bridge Replacement CE I

- Standard Urban Bridge Replacement
- Environmental (CE I)
 - Track for Archeology and not
 - Track for Asbestos and not
- Right of Way
 - Eight to 10 parcels, more appraisals, some MARs, two relocations, a miscellaneous move
 - Two paths tracked: Acceptance and Condemnation
- Utilities Overhead And In-ground
 - More overhead poles, several underground utilities
- Railroad Involvement

Four Mile Rural Road Widening into Urban Intersection EA FONSI

- "Normal" four mile safety and capacity project
- Three miles rural and one mile urban; 40% new alignment/new corridor, 60% widening of existing roadway in same corridor
- Existing two lanes with traffic demand for four lanes
 - Four proposed bridge structures
- Environmental: FONSI
 - Track for Archeology and not
 - Track for Asbestos and not
- Right of Way: 100 parcels, 20 residential relocations, five commercial relocations, 35 miscellaneous moves/signs, 40 appraisal, 60 MARs
 - Two paths tracked: Acceptance and Condemnation
- Utilities:
 - 60 power poles
 - AT&T: 4 poles (fiber only), 16,000' overhead, 750' underground
 - Gas Company 1: 2000' of 2", 650' bore
 - Gas Company 2: 1000' of 6"
 - Cable: 16,000' overhead
 - Water: 15,000' varying sizes
 - Sewer: 15,000' varying sizes
- Railroad Involvement

3.2 Project Workflow and Gantt Charts

For each project context, a PDF file containing project workflows were produced along with Microsoft Project templates containing dependencies and the work-breakdown units which yield Gantt Charts. The work-breakdown units are divided into two phases; *Phase 1 Preliminary Engineering* and *Phase 2 Final Design*. Work-breakdown units are dictated by several tracks. The same tracks were used for each project type: 1) when archaeology and asbestos issues arise and 2) when condemnation is necessary in the ROW. Thus, for each project context there are four accompanying Microsoft Project files with allowances for each of those track options. While the PDF files and Microsoft Project templates are too large to include in the report, they are available for download at: <http://ktc.uky.edu/ismyprojectschedule/>.

3.3 Glossary

The critical path schedule glossary defines work-breakdown units shown the on the CPM templates developed for KYTC highway projects. In addition to defining work-breakdown units, glossary entries discuss issues that may warrant heightened attention during the project development process including Red Flags and Side Notes. The glossary entries include all work-breakdown units across the three project types; therefore there are some entries applicable to Four Mile Rural Road Widening into Urban Intersection EA FONSI project context that are not pertinent to the Rural Federal Bridge Replacement CE I project context. The glossary is included as an Appendix Project Time Management Handbook: KYTC's Highway Project Critical Path Work-Activities Glossary.

4. Conclusion

KYTC's Office of Project Development is responsible for ensuring that projects defined in the Highway Plan are constructed. For the first time in many years, the current Highway Plan's program is fiscally balanced — the Cabinet has been asked to prepare all the projects shown in this biennium. As such, it is imperative that KYTC project managers effectively use project time management tools (e.g., Gantt Charts) to schedule and track project development. As noted in the introduction, KYTC currently negotiates estimated hours and project milestone dates only *after* the design consultant has been selected. Requiring selected consultants to develop a CPM schedule as part of, or immediately following, the negotiation process should become a standard practice.

This project sought to alleviate scheduling challenges by developing a method to produce and use CPM schedules. Scenario-based CPM schedules were prepared for three project contexts: Rural Federal Bridge Replacement CE I, Urban Federal Bridge Replacement CE I, and Four Mile Rural Road Widening into Urban Intersection EA FONSI. KTC elaborated critical paths with the assistance of KYTC experts in project management, environmental processes, utilities location, right-of-way (ROW), and highway design. An extensive glossary defines work-breakdown units.

Research yielded PDF flowcharts which document the project development process for each project context examined, Microsoft Project files with dependencies for each context, and the work-breakdown units which are dictated by several tracks. The same tracks were used for each project type: alternative tracks when 1) archaeology and asbestos issues arise and 2) when condemnation is necessary in the ROW. As noted previously, these tools can be downloaded at: <http://ktc.uky.edu/ismyprojectonschedule/>.

Using project time management tools, such as CPM and Gantt Charts, will help to ensure projects are let on time. However, project managers and consultants must update schedules as project development unfolds. Any events that will influence original timelines should be incorporated into revised versions of CPM schedules and Gantt charts. These materials should be periodically reviewed to confirm they are up to date.

While this project represents an initial attempt to expand the KYTC project management toolkit, future efforts in this area should focus on project time management training and the development of CPM schedules for additional project types and contexts so that project managers are prepared for any and all schedules and their attendant contingencies.

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Appendix A Project Time Management Handbook: KYTC's Highway Project Critical Path Work-Activities Glossary

Is My Project on Schedule?

Project Time Management Handbook: *KYTC's Highway Project Critical Path Work-Activities Glossary*

The Kentucky Transportation Cabinet's (KYTC) Mission is to provide a safe, efficient, environmentally sound, and fiscally responsible transportation system that opens economic opportunities and enhances the quality of life in Kentucky. This mission guides the Cabinet's efforts to serve citizens of the Commonwealth.

The Department of Highways' role in fulfilling the Cabinet's mission is to improve and maintain the Commonwealth's roads and bridges. The Department has a construction program that is legislatively enacted through the *Highway Plan* and a maintenance program which is legislatively enacted through the biennial budget process. The Department's performance in delivering the *Highway Plan* is measured programmatically by its ability to successfully deliver all the projects in the plan. A successful project is one that meets the defined scope with quality solutions and deliverables on the schedule given and within the budget specified in the *Highway Plan*. Improving the success rate of project delivery helps the Cabinet fulfill its mission and enriches the lives of all Kentuckians.

Critical Path Work-Activities Glossary

It is imperative that KYTC project managers (PMs) use project time management tools (e.g., Gantt Charts) to schedule and track project development. To assist PMs with project scheduling, critical path method (CPM) templates have been created for typical project contexts and common project phases. This *Critical Path Work-Activities Glossary* contains descriptions of the work-breakdown units (i.e., work activities) shown on the CPM templates which have been created for KYTC's highway projects.

Project Time Management

Time management is a key aspect of project management. As such, it is a core knowledge area and closely tied to project scope and cost. The main purpose of project time management is to build processes and outputs into a project that help the PM and Project Development Team (PDT) ensure timely completion. Failing to meet a project's schedule lowers the Department's *Highway Plan* delivery success rate and hampers KYTC's ability to fulfill its mission.

At the start of the project, the PM creates a schedule to illustrate how project tasks will be sequenced and allocated. One tool commonly used to visualize and manage the project schedule is the CPM. To calculate project duration, the PM identifies the critical path. The critical path is the sequence of activities in the network diagram that is the longest (it controls project duration). The CPM schedule is normally created using the Microsoft Project schedule program. PMs must create a project schedule which includes required project activities and meets the legislatively prescribed schedule.

The PM and PDT should use the CPM schedule to track and manage work progress. The CPM schedule helps the PM direct resources toward needed work activities as well as report schedule status and progress to the team and KYTC management. Tracking and reporting work focuses the team on getting work done within the scheduled durations.

The PM should continually monitor the critical path. Any changes to work-activity durations on the critical path will affect a project's finish date. The PM should also monitor activities not located on the critical path to determine if potential delays would place them on the critical path. The PM and PDT frequently review and discuss the project schedule. Conducting reviews and discussions are especially critical when preparing

for District quarterly Project Reviews and at each Project Milestone Meeting, where any variance from the baseline schedule should be identified and noted.

If a work-activity duration begins to slip and exceed the baseline, the PM (and appropriate members of the PDT) must investigate the root causes. Possible sources of delay include overscheduled resources or complexity in an activity that was not originally known. In some cases, the original duration estimates may have been inaccurate. To resolve a problem, it is imperative for the PM and PDT to understand the actual root cause(s) of a schedule delay. Once the root cause(s) of a schedule delay are identified, the PM and PDT brainstorm possible solutions. These may include acquiring additional resources, improving coordination between team members, or extending the project schedule. Any major schedule modifications that change the project milestone dates must be approved by Central Office Project Development.

Acronym	Definition
AASHTO	American Association of State Highway and Transportation Officials
ACM	Asbestos-Containing Materials
ADT	Average Daily Traffic
APE	Area of Potential Effect
ASSR	Acquisition Stage Relocation Report
BA	Biological Assessment
BNR	Below Notification Requirements
BO	Biological Opinion
CAA	Clean Air Act
CAP	Communicating All Promises
CBR	California Bearing Ratio
CDE	Chief District Engineer
CE	Categorical Exclusion
CHAF	Continuous Highways Analysis Framework
CPM	Critical Path Method
CWA	Clean Water Act
DAQ	Division of Air Quality (Kentucky Energy And Environmental Cabinet)
DEC	District Environmental Coordinator (Find First Instance!)
DES	Design Executive Summary
DHV	Design Hourly Volume
DLG	Department For Local Government
DNA	Data Needs Analysis
DTM	Digital Terrain Model
EA	Environmental Assessment
EATS	Environmental Analysis Tracking System
ECA	Environmental Corrective Action
EIS	Environmental Impact Study
EO	Environmental Overview
EPA	Environmental Protection Agency
EPM	Environmental Project Manager
ESA	Endangered Species Act
ESA	Environmental Site Assessment
ESAL	Equivalent Single Axle Load
ESC	Engineering Services Contract
FHWA	Federal Highway Administration
FMV	Fair Market Value
GNSS	Global Navigation Satellite System
GPR	Ground Penetrating Radar

Hazmat	Hazardous Materials
HMA	Hot Mix Asphalt
IP	Individual Permit
IPA	Individual Project Agreement
JUM	Joint Utility Information Meeting
KPDES	Kentucky Pollution Discharge Elimination System
KURTS	Kentucky Utility and Rail Tracking System
Lidar	Light Detection and Ranging
LOP	Letter of Permission
LPA	Local Public Agency
LRC	Legislative Research Commission
LWCFA	Land and Water Conservation Fund Act
MAR	Minor Acquisition Review
ME	Mechanistic Empirical
MOT	Maintenance of Traffic
MPO	Metropolitan Planning Organization
MUTCD	Manual on Uniform Traffic Control Devices
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NHS	National Highway System
NOA	Notice of Availability
NOI	Notice of Intent
NPS	National Park Service
NRHP	National Register of Historic Places
PCB	Polychlorinated Biphenyl
PCC	Portland Cement Concrete
PDM	District Project Development Branch Manager
PDT	Project Development Team
PIO	Public Information Officers
PIP	Public Involvement Plan
PM	Project Manager
POCI	Project of Corporate Interest
PODI	Project of Divisional Interest
PS&E	Plans, Specifications, & Estimates Branch
REC	Recognized Environmental Condition
RFP	Request For Proposals
ROW	Right of Way

SHPO	State Historic Preservation Office / Kentucky Heritage Council
SIP	State Implementation Plan
SME	Subject-Matter Expert
STIP	Statewide Transportation Improvement Program
SUE	Subsurface Utility Engineering
TIP	Transportation Improvement Program
TMP	Traffic Management Plan
TVA	Tennessee Valley Authority
USACE	U.S. Army Corps Of Engineers
USCG	U.S. Coast Guard
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
UST	Underground Storage Tank
WQC	Water Quality Certification

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PHASE 1 PRELIMINARY ENGINEERING

ASSIGNMENT OF PROJECT

Once the *Highway Plan* is approved, the State Highway Engineer's Office assigns projects with current biennium design phases to the District Project Development Branch Manager (PDM) through the Chief District Engineer or to a PM or program manager within the Department. For each project, the *Highway Plan* defines the schedule, budget, and scope. The PM is responsible for delivering the project in accordance with the parameters specified in the *Highway Plan*. The PM should be involved in a project's pre-design activities, is responsible for the concept and final design phases, and serves as an advisor during construction.

For projects assigned to the District, the PDM may serve as PM. The PDM may also delegate project management responsibilities to other personnel based on available resources and workloads. In some unique cases, a PM not from the District in which the project is being undertaken may be assigned (another District PM, a Central Office PM or a Consultant PM).

The PM is responsible for project development from project initialization to letting. When the project is assigned, the PM should review and confirm their understanding of the project objectives, scope of work, budget, and schedule. The best methods for understanding project objectives and scope are:

- (1) Reviewing the early scoping study recommendations, conclusions, and commitments, and
- (2) Performing a field review of the project with the appropriate subject-matter experts (SME) (e.g., roadway design, traffic operations, safety, right of way [ROW], utilities, survey, maintenance and construction).

EARLY SCOPING/PURPOSE & NEED/PROJECT FOOTPRINT

Once a project begins, the PM collects and reviews existing project information to gain a basic understanding of project purpose and identify knowledge gaps. The PM should develop a preliminary understanding of the scope, footprint (i.e., the geographic boundaries of the project), and project context.

Various entities and stakeholders (e.g., Area Development Districts (ADDs), District Offices, and local/elected officials) can propose projects to address safety, operational, or other transportation system needs. Because potential projects have a variety of origins, a thoroughly developed initial project definition may or may not exist. In the Early Scoping/Purpose and Need/Project Footprint work activity, the PM must attain a clear definition of the project purpose, goals, and scope. With this knowledge in hand, the PM should define objectives and develop a course of action to meet those objectives.

As early as possible, the project should be clearly defined. The project definition includes the following:

- Project type (as defined in the *Highway Plan*)
- Project description (e.g., project location, magnitude and length, classification, current average daily traffic [ADT])
- Draft *Purpose and Need* statement
- Roadway characteristics (existing conditions)
- Potential options to consider (without preference)
- Design criteria
- Proposed access control
- Possible funding types
- Potential environmental actions
- ROW requirements

- Number and types of bridge and drainage structures anticipated

Several project documents may have been prepared during a project's initialization, such as planning studies or intermediate planning studies. Planning studies are typically performed at the corridor scale and focus on feasibility and priority issues. Intermediate planning studies focus on the conceptual and preliminary engineering aspects of a project. A *Project Scoping Summary* (Form TC 61-6) may be available. This form contains the project description, scope, footprint, and other salient information defining the project. Another potential source of project information is the *Continuous Highways Analysis Framework (CHAF)*. CHAF is an application enabling users to collect, track and analyze identified transportation needs and is available to KYTC employees.

All projects that include National Environmental Policy Act (NEPA) documentation must have a *Purpose and Need* statement. A preliminary version of this statement is prepared during a project's early scoping stages. A clear, well-justified *Purpose and Need* statement explains to the public and decision makers why the expenditure of funds is necessary and worthwhile. The *Purpose and Need* statement is evaluated continually throughout project development and modified as needed based on information gained during Phase 1 (Preliminary Engineering and Environmental Project Phase). The Federal Highway Administration's (FHWA) Environmental Review Toolkit provides guidance for developing a *Purpose and Need* statement. It is available online at:

<http://www.environment.fhwa.dot.gov/projdev/tdmelements.asp>

The PM is responsible for tracking project scope throughout project development — from early scoping through the letting process. Just as a project's *Purpose and Need* may evolve, the project scope may also be refined during Phase 1. At each milestone meeting the PM should compare the initial project scope to the scope captured in the project plans. Scope refinement is expected throughout project development, but special care should be taken to ensure that additional scope (i.e., scope creep) is not added to the project.

Red Flag: If a project requires further definition or its scope needs to be clarified, the PDM should work with the Chief District Engineer (CDE) and Central Office to gain a preliminary understanding of the project purpose and to identify knowledge gaps.

Red Flag: At the beginning of Phase 1, the PM must determine how much time SMEs require to complete their respective tasks and then establish a schedule which reflects this information. The PM should request input from SMEs to understand their responsibilities. The transportation decision-making process requires different functional divisions within KYTC to work together. The PM orchestrates the PDT's efforts to ensure projects are delivered in accordance with project milestone dates.

DESIGN FUNDING AUTHORIZATION

The PDM should file a request for funding authorization with the Location Engineer using Form TC 90-122, *Request for Funding Authorization* (**HD-Exhibit 200-03**), and *Project Spend-Down* (**HD-Exhibit 200-04**). A *Design Funds Documentation Summary* (**HD-Exhibit 200-05**) should be used to develop an estimate of needed funds.

The Division of Program Management prepares Form TC 10-1, *Project Authorization* (**HD-Exhibit 200-06**). When funds are authorized it distributes the form to the Location Engineer and PDM. For Federal-aid projects, the Division distributes the approved *PR-1 Federal Authorization* form. Typically, authorizations are made for each phase of the project development process: Planning, Design, ROW, Utility, and Construction.

Red Flag: From the initial request to approval, Design Funding Authorization may take several months, especially at the beginning of a new biennium and new *Highway Plan*. Central Office must conduct

organizational planning efforts to prioritize projects based on risk, funding, and the Cabinet's strategic plan. When sending multiple Design Funding Requests, the PDM should work with Central Office to prioritize projects and communicate the needs and the risks. If a project is time sensitive (e.g., a work activity on the critical path must begin otherwise on-time delivery of the project is placed at risk), the PM should communicate to the Division of Program Management the need to expedite the Design Funding Authorization process. Federal-aid projects require FHWA approval for funding requests, which adds review time.

DATA NEEDS ANALYSIS STUDY

The Data Needs Analysis (DNA) is a brief, small scale study primarily used to: 1) gather basic existing data; 2) identify potential project development concerns; and 3) verify, and perhaps refine definitions of the project purpose, need, and scope. DNAs provide basic planning-level information for all smaller projects that do not require lengthy, detailed planning studies (e.g., bridge replacements, intersection realignments). If a project has a recently completed detailed planning study or major environmental document (e.g., Environmental Assessment [EA] or Environmental Impact Study [EIS]), the amount of work required to complete a DNA will likely be minimal.

Red Flag: DNAs include scope statements, the project development schedule, and cost estimates for design, ROW, utilities, and construction. The PM should review the DNA and use it to establish the project baseline. In completing a DNA, the PM and team members develop a more complete understanding of a project's purpose and scope of the project. Once a DNA is complete, the project scope should align with the schedule and budget. However, if the scope, schedule, and budget do not align, the PM should revisit the project definition with KYTC leadership to properly define a new scope and obtain input and buy-in from all affected stakeholders.

COLLECT EXISTING PROJECT DATA

The PM must collect as much existing data as possible before beginning the project. They must also review the *Highway Plan* to plan for and then complete data collection before a project enters the design phase. The *Highway Design Guidance Manual (HD-202.3)* describes what data are typically required prior to the design phase. These data should be gathered as soon as possible as it is important to keep data collection off the critical path. PMs should not wait for Design Funding Authorization to begin this process. Alternative sources of funding (e.g., planning study funds or overhead) may be used for data collection.

ASSESS PROJECT MAPPING and IDENTIFY PROJECT MAPPING NEEDS FOR SMALLER HIGHWAY PROJECTS (e.g. bridge replacements, spot improvements)

Project mapping can incorporate aerial survey data, data collected on the ground using traditional methods (e.g., surveying), remotely sensed data, Light Detection and Ranging (Lidar) data, and data collected using other techniques. Existing mapping (e.g., terrain, topographic, hydrologic) may be available. Lidar can also be requested from the Survey Coordinator (Division of Highway Design).

After project authorization, the PM should assess available project mapping and determine if additional data or mapping is needed. Existing mapping may suffice, rendering additional data collection unnecessary for preliminary design. The PM will likely plan to supplement existing data (Lidar or other) during later stages of project development; they can do so through the Survey Coordinator or a consultant. Utilizing existing mapping can help sustain project momentum, and it circumvents the seasonal limitations of aerial survey.

When additional data or mapping is deemed necessary for preliminary design activities, the PM should submit a request for project mapping to the Survey Coordinator. The PM and Survey Coordinator first evaluate the project area and available information. Next, they select the type of data to collect and extent of coverage. PMs should request data for the designated project area and include some extra allowance as

a buffer. The goal of collecting mapping data in buffer areas is to acquire all data at the beginning of a project and ensure further data gathering will not be required later in the project development process.

Red Flag: PMs should ensure that collected mapping data have sufficient coverage to avoid the need for subsequent data collection. It is less expensive and quicker to acquire extra data at the outset than for aerial or field survey crews to have to make extra data collection trips.

Red Flag: PMs should be aware that aerial survey collection is only performed during certain times of year. Aerial survey requests are typically made prior to the December through March period, which is the window of opportunity for collecting aerial survey data. The season, angle of the sun, vegetation, and other factors are critical considerations for scheduling aerial mapping. When requesting aerial mapping, it is critical to account for the influence of these factors. See the *Highway Design Guidance Manual (HD-202.6.5)* for details.

ASSESS EXISTING MAPPING/REVIEW EXISTING LIDAR FOR LARGER HIGHWAY PROJECTS (E.G. CORRIDOR RECONSTRUCTION, NEW ROUTES) AND REQUEST MAPPING, LIDAR, AND/OR PHOTOGRAMMETRY (IF REQUIRED)

When a project begins, PMs should check for available mapping data before requesting new data. Base resolution aerial Lidar, orthophotos, and photogrammetry data, which contain the information on spatial coordinates and elevations sufficient for roadway planning, are widely available. Higher resolution orthophotos, aerial Lidar, and photogrammetry for design-quality data may be available from KYTC or other state agencies or obtained through the inter-agency statewide aerial photography and Lidar contract.

Typically, aerial surveys are most cost-effective for design projects over 2 miles in length. For shorter projects, conventional or Global Navigation Satellite System (GNSS) ground surveys are suggested as they are generally more cost-effective. Ground surveys are usually necessary to supplement aerial surveys when attempting to locate underground facilities, obscured items, and measuring the sizes of pipes and invert elevations for inlets.

When requesting aerial mapping, work limits should be clearly specified for each project and include a buffer on all sides (typically 1,000 feet). It is best to request project limits with wide buffers to accommodate unforeseen design decisions that may impact nearby areas. Dispatching survey crews to pick up items later is expensive and can be avoided by establishing reasonable buffers for data collection at the project outset.

Requests for aerial surveys are submitted to the KYTC Survey Coordinator. Supplemental photography, mapping, and other materials can be downloaded from statewide/regional files at <http://kygeonet.ky.gov>. Designers can download project-level photos, surveys, and other materials from ProjectWise.

Red Flag: PMs should ensure that collected mapping data have sufficient coverage to avoid the need for subsequent data collection. It is less expensive and quicker to acquire extra data at the outset than for aerial or field survey crews to make extra data collection trips.

Red Flag: PMs should be aware that aerial survey collection is only performed during certain times of year. Aerial survey requests are typically made prior to the December through March period, which is the window of opportunity for collecting aerial survey data. The season, angle of the sun, vegetation, and other factors are critical considerations for scheduling aerial mapping. When requesting aerial mapping, it is critical to account for the influence of these factors. See the *Highway Design Guidance Manual (HD-202.6.5)* for details.

BUILD YOUR TEAM

Based on the resource determination and identified project needs, the PDM or PM should assemble an appropriate PDT. The PDT includes core preconstruction personnel, representatives from other functions (e.g., construction, operations, and traffic), and the Central Office Highway Design Location Engineer, at a minimum. The team should utilize SMEs as required. The PDM seeks to ensure the consistency of the Design Staff workload, while also building a PDT whose expertise and availability can accomplish project goals in a timely manner. For example, if the District Design Staff are overcommitted, design activities could be assigned to other internal resources, statewide consultant services, or consultant services selected through the Division of Professional Services. Issues that can influence PDT selection include:

- Project Schedule / Milestones
- Environmental Impacts & Mitigation
- Difficulty Obtaining ROW
- Utility Relocation

The fiscal year in which the ROW process will be initiated is critical for deciding how to build the PDT. The schedule is typically prepared around this milestone date. Fast-track or high-priority projects assigned to the Districts may also influence the schedules of ongoing projects.

The *Highway Design Guidance Manual (HD-205)* discusses consultant administration.

Central Office Support: The Highway Design Location Engineer provides support and serves as liaison between the District Design Staff, the Division of Highway Design, other Central Office divisions, and the FHWA.

DECISION POINT: ARE TRAFFIC COUNTS NEEDED FROM THE CONSULTANT?

Traffic data are one of the most important factors in highway project design and influence many decisions, such as number of lanes, roadway geometrics, and the need for turn lanes. Traffic data also shape the content of a project's *Purpose and Need* statement. If after reviewing the existing traffic information the PDM deems additional traffic data are needed, the PDM should consult the Division of Planning to determine if traffic counts will be conducted by the prime design-engineering consultant. If so, this work activity should be included in the project's Request for Proposals (RFP).

DECISION POINT: CONTRACT FOR FULL DESIGN OR PHASE 1 WITH MODIFICATION

When consultant contracts are used for design, more complex projects are regularly contracted with two phases. Phase 1 is the conceptual design phase. During this phase, alternatives are studied and one is chosen as the preferred solution. Phase 2 is the final design phase, during which the selected alternative is documented in plans and specifications so that ROW can be purchased, utilities addressed, and road construction commence. On complex projects, it may be difficult to assess the amount of effort and work needed for Phase 2. Therefore, a contract is negotiated and awarded for Phase 1. Once Phase 1 contract terms are fulfilled, a modification to the existing contract can be negotiated and awarded for Phase 2.

SCOPE VERIFICATION MEETING

As soon as possible after project authorization, the PM and District Environmental Coordinator (DEC) should consider the potential environmental impacts in the area of the project construction. On Federal-aid projects with an anticipated NEPA document of Categorical Exclusion (CE) Level 3 or above, a scope verification meeting should be held to discuss the project scope and probable environmental impacts. The purpose of a scope verification meeting is to bring together key members of the PDT (e.g., PM, FHWA, Environmental SMEs, and other team members) before the Pre-Design Conference to discuss work that needs to be initiated and, especially, what level of NEPA document should be pursued. As the level of

NEPA document increases, so does the time, effort, and cost of the environmental studies. Neither KYTC nor the FHWA want to perform unnecessary work. Their focus should be restricted to identifying a project development path which pairs the appropriate level of environmental study with a timely project delivery schedule. The scope verification meeting helps ensure that all team members concur with the planned level of preliminary engineering and environmental work.

The scope verification meeting is typically conducted between the advertisement for Professional Services and the Pre-Design Conference. Timing of the meeting is important, to ensure that all parties agree with the scope of the work to be tasked to the consultant prior to the Pre-Design Meeting. The scope verification meeting may be held prior to advertisement if enough information about potential impacts is available.

Red Flag: On challenging highway projects, as Phase 1 progresses, it is possible the scope will evolve from what was originally envisioned at project initiation. A change in scope may affect the type of environmental document needed — the document level could increase or decrease. In these cases, the PM will identify the project issues to the PDT (especially the SMEs), discuss the probable environmental impacts associated with these changes, and determine if a different environmental document type is warranted.

Red Flag: If during the development of the environmental document the PM and SMEs determine that environmental impacts are greater than originally believed, a higher-level environmental document may need to be prepared. Depending upon the environmental work required, scope of the public comments received, and whether additional alternatives or studies are required, development of the environmental document may require additional time. This may negatively impact the project schedule.

PROFESSIONAL SERVICE PROCESS

If consultant services will be used in project development, the Division of Professional Services assists the PM in advertising for services and securing contracts. The Division of Professional Services also helps the PM throughout the duration of contracts by processing consultant pay estimates for payment and monitoring consultants.

The PDM should be involved in a project's pre-design activities and will likely know from its inception whether consultants will be responsible for project development activities. If consultants are to undertake project development activities, the PDM or PM should begin to prepare consultant design fee estimates well before the pre-design meeting is held. Design fee estimates are often based on a percentage of the construction estimate. For example, design fees on large projects could range from 10% to 15% of the construction estimate. For small projects, such as a bridge replacement, fees can run between 20% and 50% of the construction estimate. The Design Funds allocated for the project are based on these early estimates. A final Design Fund estimate can be obtained by summing the consultant design fee, administrative costs, and KYTC's costs. Consultant design fee estimates are adjusted throughout the beginning stages of the project. Developing production-hour estimates before the pre-design meeting is useful for determining the consultant fee. Production hour estimates may be revised after the pre-design meeting or if the scope is refined.

The Division of Professional Services webpage has tools and guidance available, including the *Professional Services Guidance Manual*. Guidance on the administration of consultant contracts is available in the *Highway Design Guidance Manual (HD-205)*.

Red Flag: A limited number of projects can be advertised in the Division of Professional Services' monthly procurement bulletin. A PM should contact the Division of Professional Services as soon they know consultant services are needed and work with Division staff to start the process. Otherwise, a project could experience delays as a result of waiting to complete the consultant selection process.

Red Flag: To begin the consultant selection process, the Division of Professional Services needs a RFP for a Professional Services Contract. The PM is responsible creating the RFP. A well-written RFP facilitates the selection of the best qualified firm to perform engineering and engineering-related services. Sufficient time should be allocated for RFP creation and review. The amount of time required depends on the RFP's complexity and can range from less than one day to several weeks if a review is necessary.

CONSULTANT SELECTION

A consultant selection committee determines which consultant is offered a contract for a specific project; see the *Professional Services Guidance Manual (PS-15-04)*. Because the procurement and contracting process can take several months, the PM should account for it when developing a project schedule.

PRE-DESIGN MEETING

Once a consultant is selected, the PM schedules a pre-design meeting (generally within 10 business days of selection) and invites the appropriate SMEs. During a pre-design meeting, project data are reviewed to refine the project's purpose and need, review the consultant's scope of work, and discuss proposed work units for the consultant contract. **Exhibit 200-11** in the *Highway Design Guidance Manual* provides sample minutes for a pre-design conference.

FURTHER REFINE SCOPE

The PM, assisted by the PDT, and the consultant will further investigate the project scope prior to determining effort and duration of the work activities. Major discrepancies, issues, or gaps between proposed work units and/or hours are resolved by the Division of Professional Services. If legitimate issues arise with the scope or schedule during contract negotiations, the PM may need to refine both. Examples of legitimate issues include identification of an environmentally sensitive issue, a major utility conflict, ROW challenge, and unforeseen needs not incorporated into the original scope and schedule. The PM should check with the State Highway Engineer's Office, CDE, Location Engineer, and possibly the sponsor to resolve any major issues.

Red Flag: If the refined scope requires the consultant to do additional work on a project, more time or design funding may be needed. The PM should keep in mind that additional time or funding requests may jeopardize on-schedule project completion. They should be judicious when considering significant changes to the project scope.

NEGOTIATIONS/CONTRACT APPROVAL

The Division of Professional Services determines which types of negotiations are appropriate. It then coordinates those negotiations with the PM and consultant.

Between the pre-design meeting and notice to proceed, the PM and consultant determine the effort (hours) and duration (milestone dates) for all assigned project activities. The PM and consultant should first prepare independent production-hour estimates for each work unit. The PM submits the following items for the approved production-hour estimates:

1. Pre-design conference minutes,
2. Complete list of milestone target dates,
3. Recommended percentages for payment in accordance with the established target dates,
4. Verification that funding is available, and
5. Contract type (e.g., lump sum, cost plus).

The Division of Professional Services uses these items to negotiate a design fee with the consultant. After negotiations are complete and the PM submits the necessary information, the Division of Professional Services prepares the contract, which is signed by the consultant and appropriate Cabinet management.

NOTICE TO PROCEED

After negotiations are complete, the Division of Professional Services finalizes the contract and notifies the consultant of the notice to proceed. After receiving approval from the Legislative Research Commission (LRC) Contract Review Committee, the Division informs the consultant they can now bill the project.

PUBLIC INVOLVEMENT PLAN

A critical element of all projects, public involvement encompasses more than a single meeting or hearing near the end of the project development process. It should begin early in the project and remain ongoing throughout. To avoid, minimize, and mitigate impacts, as well as to narrow the range of alternatives, it is essential to understand the values of the community impacted by a project. Opinions expressed by the public are important considerations in the transportation decision-making process.

Public involvement needs can vary significantly between projects. For example, on projects where several alternatives are under consideration or projects with heightened controversy, more public meetings may be necessary. Understanding the tradeoffs and constraints associated with each alternative is critical for informing the public and increasing the likelihood of public acceptance. Community awareness of the tradeoffs and constraints involved in the process should encourage public acceptance of the project. Early public involvement lets community members offer critical insights about the project's goals, needs, and its effects on the community.

As early in the project development phase as possible, the PM, DEC, and District Public Information Officer (PIO) should discuss public involvement strategies. Specifically, they must determine whether a formal public involvement plan (PIP) or an informal plan will be used on the project. Consideration should be given to developing a PIP for every project advanced through project development. On projects that require an EIS a formal PIP is mandatory.

A plan's content should be tailored to individual project needs. The PIP may include items or activities ranging from individual property owner contacts on small projects to a series of public involvement meetings or public hearings on more complex projects. Some PIPs may prescribe the formation of a citizens advisory committee. The purpose of such a committee is to involve many property owners or special interest groups when significant environmental issues or concerns must be addressed. It is critical to develop a PIP that facilitates communication between KYTC and the public so the Cabinet can make the best transportation decision.

The PDT should develop an outline of the PIP early in the project development phase. The plan must include any federally required public hearings. Supplemental public involvement meetings that will contribute to better decisions on the location or detail of a project may be included as well. The plan may be modified as the project advances, and it should be reviewed by the PDT at critical stages in project development. The PIP should describe the specific methods that will be used to conduct public outreach, such as telephone surveys, newsletters, social media, websites, and focus groups.

For more information on public involvement and meetings, see the *Highway Design Guidance Manual (HD-600)*.

Red Flag: Before the pre-design meeting the PM needs to estimate the extent of public involvement. In doing so, public involvement can be scoped and included in the contract.

DATA GATHERING

Upon receiving the Notice to Proceed, it is imperative for the PM to determine what additional data are needed to develop preliminary alternatives. Key information and features within the corridor should be

identified and mapped before alignment studies begin. Without data on the study area, the study of alternatives may be flawed because the PDT will not understand the breadth and magnitude of project impacts and issues.

EXISTING GROUND SURVEY/PROJECT MAPPING

Early in the project, project mapping is assessed. (See entry **ASSESS PROJECT MAPPING**.) At the beginning of Phase 1, available project data and mapping are reviewed to ensure sufficient coverage and identify additional data collection needs. Data collected from ground surveys are often necessary to locate additional existing features (e.g., underground facilities, obscured items, and measuring the sizes of pipes and invert elevations for inlets) and inform supplemental mapping.

During data collection and mapping, all existing property lines, ROW lines, easement lines, and KYTC permits and agreements within the project limits (and in some instances those in the general proximity of project limits) must be identified. All monuments and features that aid in the description of property lines should be located.

Red Flag: As with all field activities, ground survey crews should respect the rights of individual property owners and ask permission before entering their property. At minimum, a two-week notice should be given to property owners before entering their property.

IDENTIFY AND CONTACT INVOLVED UTILITY COMPANIES

Communication with utility companies should begin as early as possible in the project development process. Early coordination with impacted companies reduces the amount of risk to a project's schedule and budget. During these communications, utility companies should be encouraged to identify methodologies that will either avoid impact to utility facilities, expedite facility relocations, or allow for the inclusion of relocation plans in the roadway plans. Early coordination may be appropriate to aid in the acquisition of parcels that will be necessary for the relocation of utility facilities or identify replacement utility easement needs.

Utility companies should play an integral role in the design process and receive invitations to key meetings. At these meetings they can be advised of and consulted about impacts of the roadway construction on their facilities. The PDT's selection of alternatives should account for information provided by utilities on where their facilities will face significant impacts in terms of time and cost. Using this knowledge, the PDT first attempts to avoid a conflict. If this is not possible, the team works to minimize and mitigate the conflict. Utility companies should also be invited to public involvement meetings so they can address the public directly.

LOCATE UTILITIES - SUBSURFACE UTILITY ENGINEERING QL C OR D

Responsibility for identifying the location of existing facilities within the project limits lies with the PM. To obtain appropriate data, the PM should coordinate with the District Utility Agent during the early stages of project development. Locating existing utility facilities should occur as early as the Pre-Design and/or Conceptual Design phase (Phase 1), especially when there are large concentrations of facilities or a major utility facility.

Subsurface utility engineering (SUE) can be used to more accurately locate belowground facilities. The PM should determine what level of SUE quality is appropriate for various stages of project development. When making their assessment, the PM should also consider the quality level necessary to confirm a conflict with an existing utility of interest. Quality Level D (QL D) is information derived solely from existing records or verbal/written recollections. Quality Level C (QL C) is information obtained from surveying and plotting visible aboveground utility features and using professional judgment to corroborate this information with

QL D information. When corridor studies are conducted to determine potential alternatives, the use of existing records or verbal information from utility companies will typically suffice.

For different stages of project development, the PM and PDT determine the appropriate SUE quality level. The quality level chosen should be commensurate with the potential for conflict and the given stage of project development. Therefore, specific areas in the project footprint may require a higher or lower SUE quality level than the project as a whole to address varying potentials for conflict. Discussions to identify affected facilities and their potential relocations should be initiated at this stage. The *Highway Design Guidance Manual* (**HD-303**) provides more information on subsurface utility location.

Side Note: KYTC's KURTS app can be used at project sites to collect geospatial data on the location of existing utility facilities and potential conflicts with the proposed road. Geospatial data are used to create a utility conflict matrix that is stored with the project's data. See the *Utilities and Rails Guidance Manual* for more information.

LOCATE UTILITIES - SUBSURFACE UTILITY ENGINEERING QL A OR B (IF REQUIRED)

The required SUE quality level depends on the current stage of project development. During a corridor study to determine potential alternatives, the use of existing utility company records or verbal recollections will usually suffice. The quality level adopted to locate existing utility facilities should increase as a route is selected, refined, and designed in detail.

The required quality level also depends on potential impacts to complex utility networks (e.g., older networks or those with a high potential for costly facility relocations) or utility facilities that are consequential from the perspective of time and cost. If there is a significant probability of roadwork impacting such a facility and a highway can be designed to avoid that facility, it may be prudent to request early Quality Level A or B data, which provide accurate horizontal and (in the case of Quality Level A) vertical data at that location. An example of where this approach should be used is a complex utility facility on an urban highway project with existing ROW that is limited, narrow, and congested. The PM should identify specific areas in the project footprint that may require a confirmed horizontal and/or vertical location to address these specific locations of impactful utility conflicts.

Red Flag: As the Quality Level of utility location data increases, so does the coordination with utility owner. Collecting data for QL A or QL B efforts is only possible through close coordination with the utility owner. A SUE investigation, as described, can be paid for using D phase funds. An engineering agreement with a utility can also be paid for with D phase funds. U phase funds can be used for both engineering agreements and relocation, and can be authorized early where heightened coordination is needed during plan development. See the *Highway Design Guidance Manual* and *Utilities and Rails Guidance Manual* for additional information.

IDENTIFY AND CONTACT INVOLVED RAIL COMPANIES

Any time a highway project can potentially impact a railroad, KYTC must coordinate with the railroad company. This includes projects that are at-grade, over, or under railroad tracks as well as projects impacting railroad-owned property.

Rail coordination is an integral component of project development when a railroad is present. Undertaking railroad coordination activities early in project development fosters effective communication between KYTC and railroad companies and sets the stage for effective project collaboration. The PM may expect the railroad's engineering review/approval of project details and ROW review/approval to occur separately. But individual railroads vary in their approaches.

While delays and additional expenses are normal on projects with railroad involvement, early coordination helps minimize and manage the effects to KYTC's schedule and budget. As an example, time-consuming and costly redesign work can be avoided if railroad expansions are planned and the PDT initiates an engineering review in time to adjust a preliminary structure layout. The PM should contact the Division of Right of Way and Utilities Railroad Coordinator as soon as possible, but no later than selection of the preferred alternative.

The Railroad Coordinator provides the PM and PDT information and feedback from the railroad concerning potential impacts of the highway on existing railroads. The Railroad Coordinator helps obtain necessary approvals from the railroad company and coordinates with the project letting schedules.

Red Flag: As soon as it is known there will be railroad involvement on a project, the PM should document it in the project database system. This can be done by adding *Railroad Involvement* to the *Project Concerns* area, notifying the Railroad Coordinator of railroad involvement on a project.

Red Flag: A railroad's location and topography can normally be obtained from regular roadway project mapping. When the railroad's location is critical, additional survey data may be needed (e.g., if drainage is diverted toward the railroad ROW, supplemental data may be needed through the impacted area). To index the railroad to the roadway project mapping, the distance to the nearest railroad milepost on each side of the highway centerline must be measured and the information on the mileposts recorded. Be aware that railroad companies may require special permits to enter their property for ground surveying. In some cases, KYTC surveyors may have to be escorted by railroad personnel while on railroad property.

Red Flag: Railroad companies have clearance requirements for the construction of permanent or temporary facilities that encroach on or cross the railroad ROW (e.g., road facilities to maintain traffic flow during construction). A standard vertical clearance of 23 feet must be provided. Vertical clearance is measured from the top of the high rail to the lowest point of the structure in the horizontal clearance area of the railroad. The railroad company establishes horizontal clearance requirements from the centerline of track to the face of a pier, abutment, or other obstacle. Contact the Division of Structural Design for exact clearance requirement information, which can be factored into the study of preliminary roadway alternatives.

Red Flag: All land parcels within the railroad ROW needed for highway construction are to be taken as either permanent or temporary easements. Descriptions must be tied to both highway and railroad stationing.

Red Flag: Highway projects with railroad involvement carry additional costs. To ensure these costs are accounted for in and covered by highway project funding, the PM should request a cost estimate from the Railroad Coordinator for providing railroad-related activities and coordination (e.g., preliminary engineering, final engineering, administration, construction management, flagging).

COMPLETE TRAFFIC FORECASTING

Analysis of current and forecasted future traffic conditions is a critical input into the project development process. Traffic data and traffic forecasting are needed to determine the nature, physical characteristics, and extent of a proposed project. Traffic data exert a major influence on a project's *Purpose and Need* statement (e.g., high average daily traffic may result in a project purpose of *address capacity and mobility*).

Traffic forecasting aims to produce the best possible estimates of present and projected traffic to understand a project's effects on the overall transportation network. The type and complexity of a proposed project dictate the level of detail required of traffic data to adequately forecast future traffic. In general, more robust analysis is required for roadway capacity expansions. Small projects and spot improvements have less complex requirements.

Major construction or reconstruction projects should be designed to accommodate (at minimum) 20-year forecasted traffic volumes. For 20-year traffic volumes, the design year is 20 years from the estimated base year — the year in which a project is anticipated to open for traffic use.

Present-day traffic volumes are used during the design of smaller projects (e.g., restorations), spot improvements, and bridge replacements. Rehabilitation projects also use present-day traffic volumes except for their pavement design, which considers projected volumes and loads. If after reviewing existing traffic information the PM decides additional traffic information is needed, they should submit a request to the Division of Planning.

Red Flag: If project construction is delayed, forecasted traffic volumes may need to be updated. When this occurs, the PM should discuss the traffic forecasts with the Division of Planning and/or FHWA to determine if the traffic volumes need revisions. For off-schedule projects (i.e., those projects that have been significantly delayed and not made it to letting) the FHWA may ask KYTC to develop updated traffic volume forecasts to verify the project's *Purpose and Need* are still applicable for the revised context.

TURNING MOVEMENT COUNTS (IF REQUIRED)

A key traffic consideration for intersection design is vehicle turning movement counts. These data are a controlling factor when making decisions related to several aspects of an intersection design (e.g., type of intersection, whether auxiliary lanes are needed for left- and/or right-turning movements, geometric dimensions of lanes and the intersection, and selection of traffic control devices).

Intersection geometric design is also significantly influenced by the types of vehicles using a facility. Turning movement counts help the PDT select the design vehicle. KYTC uses design vehicle classifications described in American Association of State Highway and Transportation Officials (AASHTO) policy.

Vehicle turning movements at a proposed intersection can be determined from origin-destination studies, or from known travel demands. Future traffic at a proposed development (e.g., neighborhood, business establishment, school) can be calculated if the type and size of the development is known.

There are several options for completing turning movement counts. The Division of Planning can perform traffic count studies when needed. For these cases, the PM should submit a request for turning movement counts. The PM can also request District-level Design staff or assign the consultant team to complete turning movement counts.

ENVIRONMENTAL OVERVIEW

For large-scale, federally funded projects, an environmental overview (EO) is created in the early stages of project development. These overviews are a preliminary assessment of possible environmental impacts caused by a project and as such require field evaluation. The scope of field evaluations depends on project complexity, and range from windshield surveys (typical) to full environmental investigations (rare).

An EO may consist of one comprehensive document or individual reports, with each report detailing a specific area of environmental subject matter. It may address the full range of environmental disciplines covered under NEPA — pursuant to FHWA implementation — or it may focus on specific project elements

necessary to address requirements stipulated by other involved federal agencies, such as U.S. Army Corp of Engineers (USACE), U.S. Coast Guard (USCG), and Tennessee Valley Authority (TVA).

An EO must include a discussion of archival data collected from various sources. Usually, little fieldwork other than a windshield survey of the project area is necessary to verify existing data and conditions. As a common practice, the PDT determines the format and content of the EO during scoping or negotiation activities with the consultant.

Side Note: Conducting an EO within the project area is recommended before studying alternative corridor and/or roadway alignments.

PUBLIC MEETING #1 & STAKEHOLDER MEETING #1

For larger or controversial projects — those which require an environmental document type of FONSI or EIS — it is necessary to have a public meeting as soon as possible in the project development process to address the *Purpose and Need* statement. (Projects approved as a CE may also use a public meeting). Public Meeting #1 is typically an informal public kickoff for the project. The purpose of this meeting is to gather information, determine community support for the project, and understand community issues and its goals for the project.

Stakeholder engagement helps the PM and PDT develop a better understanding of conditions in the project area. Stakeholder groups may include members with a variety of backgrounds (e.g., local officials, emergency services, school transportation and/or administration, utility owners impacted). It is useful to tailor the composition of stakeholder groups to the needs and context of each project. Often the stakeholder groups continue to meet periodically to receive updates and project-related information from the PDT. If more direct involvement with the PDT is needed, the PDT may engage a subset of the stakeholder group through a focus group.

For more information on public meetings, see the *Highway Design Guidance Manual (HD-604)*.

BLANK SLATE MEETING (IF REQUIRED)

When KYTC identifies a *Purpose and Need* for a highway project but lacks a strong preference on proposed solutions (e.g., a new corridor roadway), a *Blank Slate Meeting* may be a good first step for public involvement. Blank Slate Meetings are held when there has been little study done or work completed on a project, and thus the plan for potential design alternatives remains a blank slate. They may be open to the public or invitation-only events for designated stakeholders/ citizen advisory groups. These meetings should typically occur as early in the preliminary design and environmental process as practicable.

At the Blank Slate Meeting, the PDT exhibits aerial photos of the project area/corridor, showing existing planimetric mapping with no proposed roadway elements. An environmental footprint map indicating sensitive areas can be presented if database and/or windshield investigations have already been conducted. Displays may show other available data (e.g., traffic counts, crash data, utilities). Possible roadway alternatives and geometric improvements are not shown.

During the meeting, KYTC officials introduce the project's purpose to attendees and state that no preferred has been identified. They communicate that the meeting's purpose is to better understand the project context. Officials solicit feedback from attendees, with a focus on their biggest concerns about the project. A member of the PDT should take notes. Attendees have the opportunity to write their concerns on the mapping or on surveys. They will also be asked to describe what steps KYTC can take, if any, to alleviate their concerns, (e.g., what project improvements they think are needed). Dialogue with attendees can help identify resources, issues, or concerns important to the community that may require consideration during design.

Blank Slate Meetings have three intended outcomes:

1. Educate the Public – The PM and PDT should inform the public and stakeholders about the project development process. Many attendees will likely be experiencing impacts from a highway project for the first time, and it is critical to describe to them the project development process. The public is more likely to trust the outcome if they understand the process and see that all impacts have been weighed against one another before a decision is made.
2. Relationship Building – Building rapport between the PDT and members of the public is crucial. KYTC and the PDT are openly soliciting public opinions during a period when there are no preferred design alternatives. A PM should seriously consider this type of meeting if: 1) they have a sense the public is wary of the project, 2) there an issue with the project of longstanding concern, or 3) the media and/or public officials are involved.
3. Fact Finding and Discovery – The PDT should gather important information about the existing context, much of which cannot be found from database searches (e.g., family cemeteries, undocumented traffic accident locations).

For more information on public meetings, see the *Highway Design Guidance Manual (HD-604)*.

RED FLAG ABBREVIATED PLANNING STUDY (IF REQUIRED)

At the beginning of project development, it is of great benefit to have information about the project context before evaluating proposed alignments. Information may be acquired through a Red Flag Abbreviated Planning Study (Red Flag Study), the goal of which is to identify early on significant existing features on a project. If these features remain unknown and are impacted by the project, KYTC may incur expenses and/or delays that could have been prevented.

A Red Flag Study is generally a bound document that collates as much database information as possible (e.g., HIS, environmental, economic, safety) and adds an enhanced layer of SME knowledge. It includes more information than other planning reports, (e.g., DNA studies), since it contains professional input from SMEs. For example, historians will do a windshield survey of the project corridor and make a list of potentially historic-eligible properties. Biologists will identify wetlands or sensitive streams. ROW Agents will evaluate properties. Utility Coordinators will catalog complex utility facilities. SME information is compiled into a list of existing human and natural environment issues, many of which may be prominent features that will significantly influence or control project design. If these features are known as roadway design begins and preliminary alternatives are created, scope of impacts on these features can be considered and — hopefully — avoided completely. The Red Flag Study can potentially save time and effort as it exposes items which, if impacted, will delay schedules and increase costs.

The PM requests the Red Flag Study of PDT members. The PM and PDT should jointly plan the study's focus, which may be as broad or narrow as needed. For example, a Red Flag Study could focus solely on environmental red flags. Or in addition to the environmental overview, it could include traffic information and potential utility or ROW conflicts. The Red Flag Study is helpful on projects that have not had a planning phase, particularly where a range of potential alternatives need to be honed and prioritized according to need and cost. The studies might also be helpful on projects with multiple designers and when a larger project team needs to be aware of the same design constraints. Information collected during a Red Flag Study becomes a part of the project record, helping establish the basis and reasoning for alignment development.

Side Note: The red flag concept may be applied to any project regardless of size or complexity. For smaller projects, Red Flag Study documentation or deliverables are adjusted commensurate with the level of the project. For example, a simple bridge replacement project will likely not need a large bound document —

red flag information can be communicated to the PDT in meetings or via a simple email. Red flag work is valuable on any size project, and it should facilitate work on project planning, development, and design.

DEVELOP PRELIMINARY ALTERNATIVES

Once a project is initiated, the PM is responsible for moving it through the design process. Preliminary design is the first step in this process (i.e., Phase 1 of project development). The main work product of preliminary design is the recording of the transportation decision and rationale in the environmental document. This is reflected in the preliminary line and grade plans. Design is only one component of preliminary design. Therefore, the PM must work with other disciplines (e.g., environmental analysis) to complete this phase.

During preliminary design, the PDT should develop a range of alternatives that fulfills the project's *Purpose and Need*. Identifying potential constraints, issues, and solutions as early in the process as practical facilitates determination of the best solution. Alternatives and corridors previously evaluated should serve as the starting point. Alternatives and corridors eliminated during the development studies should not require further investigation — as long as each alternative was developed adequately with sufficient documentation and a rationale for its elimination was provided.

Please note that the process followed during the development of alternatives can change significantly from project to project. It is scalable based on the project context and scope. On smaller projects the opportunity may exist to combine multiple steps of the process and more quickly evaluate alternatives and the scope of impacts. Projects that have generated controversy may require more alternatives and call for input from additional personnel inside KYTC, the public (e.g., during public meetings), advisory committees, or focus groups.

Project requirements and environmental documentation vary based on how significantly a project will impact the environment. On projects which receive a CE designation, project actions do not individually or cumulatively have a significant effect on the human environment. On CE projects a number of meetings may be combined to expedite the process. A public hearing may not be required for a CE project. On larger or controversial projects, a FONSI or an EIS may be required. Project size and complexity significantly affect the steps taken during the preliminary design process.

See *Highway Design Guidance Manual (HD-203.2)* for more details.

DEFINE TEMPLATE ALTERNATIVES and LOCATE ROADWAY HORIZONTAL & VERTICAL ALIGNMENTS

To fulfill the project's *Purpose and Need* and provide a reasonable and competitive alternative, roadway concepts should be developed with attention paid to engineering, environmental (the natural and human environments), and fiscal constraints. In addition, roadway designers should ensure that alternatives meet operational, safety, and other performance goals described in the *Purpose and Need* statement. The template, horizontal alignment, and vertical alignment are key factors that influence a roadway's operation, safety, and performance.

Template alternatives reflect the roadway's cross-sectional elements (e.g., number and width of lanes, shoulders, medians, auxiliary lanes, cut/fill slopes). Horizontal and vertical alignments indicate the proposed roadway's precise geospatial placement and should be developed in accordance with geometric design guidelines outlined in the *Highway Design Guidance Manual (HD-700)*.

AIR QUALITY ANALYSIS (IF REQUIRED)

An air quality impact analysis is conducted during the early stages of project development to address transportation-related air quality concerns in the project area. Both the Clean Air Act (CAA) and NEPA

require the consideration of air quality for federal transportation investments. Transportation projects must be included in the Kentucky Statewide Transportation Improvement Program (STIP) and, if located in a metropolitan planning organization (MPO), must also be in that MPO's transportation improvement program (TIP). The CAA also mandates that all programs, plans, and projects conform to the Kentucky State Implementation Plan (SIP) and that priority be given to implementing those portions of the plan that are to achieve and maintain National Ambient Air Quality Standards (NAAQS).

Under regional conformity rules, KYTC does a high-level study of proposed projects in a region to understand how the overall program will potentially impact air quality. The Division of Planning, along with the Division of Program Management, oversees regional transportation conformity.

Project-level air quality impact analysis is performed to identify instances when a KYTC project may negatively impact air quality conformity. It can also guide alternative selection during project development. Project-level air quality impact analysis is conducted on federally funded projects that are documented using CE Level 3, EA/FONSI, or an EIS. For these project types, detailed analyses are carried out to assess specific air quality impacts that may result from the project. The level of detail in air quality analysis is contingent on project size, the existing air quality in the area, and the degree of controversy (i.e., controversy among the public).

The air quality impact analysis is the appropriate base study to document environmental conditions for alternative analysis in NEPA documents. This analysis compares impacts across multiple alternatives, allowing for a consideration of relative impacts.

Where impacts cannot be avoided, strategies for minimizing an air quality impact include altering the project's horizontal alignment — to move the project away from receptors — or modifying traffic signal timing to reduce congestion.

See *Environmental Analysis Guidance Manual (EA-600)* for more details.

Red Flag: Conformity to the purpose of the SIP means that transportation activities shall not cause new air quality violations, worsen existing violations, or delay timely attainment of NAAQS. Because the CAA requires transportation conformity, air quality analysis has a high level of importance and urgency. Regardless of whether air quality analysis is completed by the Division of Environmental Analysis subject-matter experts (SME) or consultants, schedules for deliverables must be clearly established among the parties involved; monitored by the DEC, Environmental Project Manager, and SME; and routinely tracked in the Environmental Analysis Tracking System database. The Division of Environmental Analysis SME establishes the schedule for document review and comment. The DEC manages review of the document with the PM and other appropriate District personnel and shall submit review comments to the Division of Environmental Analysis SME for inclusion with the Division's comments. The Division of Environmental Analysis is responsible for the overall review of the air quality impact analysis and preparing and compiling comments, questions, or required modifications.

Red Flag: For certain pollutants, project-level analysis focuses on intersections along the proposed project corridor, where delay and vehicle idling may create hot spots with poor air quality. Project-level analysis requires general input parameters, such as roadway geometrics and traffic volumes; this information must be available before air quality analysis can begin. Traffic data must include ADT, design hourly volume (DHV), truck percentages, fractions of light-duty and heavy-duty trucks, and, if needed, special trip generation conditions (e.g., heavy traffic generators, existing and future development plans, special events). These data are required for the existing, no-build, and all-design alternatives for the design year and the year that the project opens to traffic.

Red Flag: If local public agencies lack the specialized environmental staff to complete this level of evaluation, they must retain a prequalified environmental consultant. The schedule for completing documentation shall be determined through consultation among the project team members.

Red Flag: Altering the project and scope may require a SIP/STIP amendment, which may add time to the project development and delivery schedule.

Side Note: State-funded projects do not require detailed air quality analysis unless the project is anticipated to have some level of federal funding applied to it at a later stage.

IDENTIFY HISTORIC SECTION 106 RESOURCES

If a project receives Federal Funds, Section 106 of the National Historic Preservation Act requires that federal agencies consider a project's effects on historic resources. KYTC, acting as an agent of FHWA, carries out Section 106 implementation on federally funded highway projects. Section 106 does not mandate a specific outcome, nor does it prohibit impacts to historic properties. It requires adherence to an established process for addressing historic properties. A historic property is defined as any prehistoric or historic district, site, building, structure, or object that is listed on or eligible for inclusion in the National Register of Historic Places. Analyzing a project's impacts on historic resources entails working with consulting parties and appropriate resource agencies. Historic resources include archaeological sites, cemeteries, artifacts, and properties of cultural importance. The consulting parties must include local government and the State Historic Preservation Officer (SHPO). Local historical groups, preservation groups, recognized Native American tribe(s), or others with a demonstrated interest in the resource may be included in the consultation process as well. KYTC must make a reasonable and good faith effort to identify and evaluate historic properties within the area of potential effect (APE). The APE is the geographic area or areas within which project activities may directly or indirectly alter the character or use of historic properties, if such properties exist. See the *Environmental Analysis Guidance Manual (EA-903)* for more details.

Red Flag: The schedule for completing an assessment may vary based upon anticipated project impacts, which are contingent upon context, magnitude, and intensity. Some projects may have minimal impacts or are located in areas where there is no demonstrable potential to impact historic properties. Other projects may be in areas that require extensive investigations. Early in the project development process, records research is conducted and, if necessary, followed by field reconnaissance. More detailed studies may be needed to further define areas of concern, quantify potential impacts, and develop plans to mitigate unavoidable impacts. Consultation with the SHPO, and possibly other consulting parties, is mandatory at key points throughout the process.

Side Note: Section 106 can also apply to non-FHWA projects (i.e., state-funded projects with USACE permits or U.S. Forest Service [USFS] involvement.)

NOISE BASE STUDY

Noise impact analysis is used to identify locations where noise from highway traffic or construction may impact Kentucky's residents. Because KYTC recognizes the adverse effects of traffic noise, it evaluates reasonable measures to minimize these effects. Additionally, NEPA requires assessments of noise impacts for federal projects. The level of detail in a noise analysis is contingent on project size, the existing level of traffic noise in the area, future potential for noise resulting from the project, and the degree of project controversy (i.e., controversy among the public). The presence and type of noise receptors are also a major consideration when determining if a noise analysis is necessary. It is generally considered the appropriate baseline study to address noise impacts for incorporation into NEPA documents such as an EA, FONSI, or EIS.

Identifying noise-sensitive sites or areas is done early in the planning phase of the project. During project development, base studies are performed to assess specific traffic noise impacts and abatement measures at locations that may experience increased traffic noise levels from a project. Base studies can assist in determining if mitigating adverse noise impacts is warranted by evaluating the community benefits against the negative social, economic, and environmental effects and the costs of noise abatement measures. Noise abatement measures judged to be feasible and reasonable should be considered for such projects.

Attention should be paid to noise impacts throughout the construction phase; an emphasis should be placed on minimizing disruption from construction noise. Designers should also keep in mind that alternative construction impacts may be used to mitigate noise impacts. These practices should be included — when it is practical to do so — in notes on the plans or the proposal.

See the *Environmental Analysis Guidance Manual (EA-500)* for more details. Traffic noise analysis follows the most current KYTC *Noise Analysis and Abatement Policy*.

Red Flag: If project construction has been delayed, traffic volume forecasts may require updates. If the new forecasts project different traffic volumes, the noise impact analysis must be revised as well.

Red Flag: If local public agencies lack the specialized environmental staff to complete this level of evaluation, they shall retain the services of a prequalified environmental consultant. The schedule for completing documentation shall be determined through consultation among the project team members.

Side Note: The KYTC *Noise Analysis and Abatement Policy* contains noise abatement criteria which represent the upper limit of acceptable highway traffic noise for different types of land uses and human activities. The policy does not require that abatement criteria be met in every instance. Rather, it requires that a reasonable and feasible effort be made to mitigate noise when criteria are approached or exceeded. Designers should investigate ways of minimizing noise intrusion into highway surroundings (e.g., use of noise barriers, earthen berms, vegetation, manipulating geometrics, and other context-sensitive methods).

Side Note: State-funded projects do not require detailed analysis unless the project is anticipated to receive some level of federal funding at a later stage. If noise impacts are a concern, state-funded projects may be processed via a memorandum to document the conditions relating to traffic noise.

EVALUATE WATER RESOURCE IMPACTS

The project team, including the Division of Environmental Analysis Permit Coordinator if needed, should evaluate each viable alternative for any impacts to Waters of the U.S. Impacts to these waters should be quantified for each viable alternative as best as possible at this stage of project development. Additionally, a rough estimate of mitigation fees is helpful when considering and comparing the costs of alternatives. See the *Environmental Analysis Guidance Manual (EA-1104)* for more details.

Environmental studies are used to determine special water quality requirements that may be needed for the drainage design. When drainage items requiring special attention (e.g., stream impacts, existing FEMA flood studies) are identified, the PM should coordinate with the Drainage Branch to determine the Drainage Branch's level of involvement as preliminary alternatives are developed. See the *Drainage Manual (DR 202-18)* for more details.

Red Flag: Adjacent streams or wetlands should be avoided if they are not within the construction disturb limits. Identifying potential water-related impacts early in the project development process and refining the design as necessary to avoid water-related impacts can keep permitting off the critical path.

ESTIMATE MITIGATION COSTS

KYTC has developed several strategies to mitigate environmental impacts, including mitigation resource-banks, in-lieu fees, and on-site mitigation. Proposed mitigation can result in significant costs and should be factored into decision making when selecting a preferred alternative. As preliminary alternatives are developed, mitigation measures associated with each alternative should be identified and their costs estimated.

Water-related permitting fees are commonly the most expensive mitigation fees assessed on a highway project. Any KYTC project that has *more than minimal impact* to Waters of the U.S. or Commonwealth is likely to require compensatory mitigation per USACE or Kentucky Division of Water. When considering environmental issues during the design process, avoid impacts to water resources where possible. If impacts are unavoidable, minimize them. Once unavoidable impacts have been determined, in some cases mitigation may be required.

How alternatives will impact jurisdictional waters must be studied when seeking out a preferred alternative. In addition to scheduling impacts that may result from securing permits, the financial expense of adverse environmental effects and mitigation can be significant.

Early in the project development process, the PM is responsible for contacting the Division of Environmental Analysis for a determination of permitting requirements. They should notify Division of Environmental Analysis during the range of alternative analysis and must present an estimate of each stream/wetland impact with a description of the anticipated construction activity. The Division of Environmental Analysis will provide comments or recommendations as required, including a rough estimate of mitigation fees, to consider when comparing the costs of alternatives. See the *Environmental Analysis Guidance Manual (EA-1110)* for more details.

Side Note: Mitigation costs can include more than water-related permitting fees. For example, KYTC makes contributions to the Imperiled Bat Conservation Fund to offset impacts to summer roosting habitat for bats. While these ancillary mitigation costs usually are not as large as USACE in-lieu fees, on a large project they can be significant and should be factored in when estimating the costs of alternatives. The PM should work with environmental SMEs to estimate all mitigation costs for each alternative and present those estimates in an appropriate manner.

Red Flag: Avoid adjacent streams or wetlands if they are not within the construction disturb limits. Identifying potential water-related impacts early in the project development process and adjusting the design as necessary to avoid water-related impacts can keep permitting off the critical path.

ARCHAEOLOGY OVERVIEW

Archaeological overviews are conducted in the early stages of project planning and development. They are often used to support project-level planning studies and corridor and alignment comparisons; they may also be incorporated into studies for state-funded projects. The purpose of an overview is to determine if there are known sensitive archaeological resources along the project corridor, or the probability that archaeological resources could exist there. They identify where archaeological resources may be impacted by project construction. The archaeological overview helps guide project decision making.

Some project types, such as those addressed with a CE, have a low potential to encounter archaeological resources and do not require an archaeological overview. An archaeological overview is prompted by any of the following:

- 1) Preparation of a planning study environmental overview,
- 2) Preparation of an environmental overview for a state-funded project, or

- 3) Comparison of multiple alignments or corridors in the NEPA process.

See the *Environmental Analysis Guidance Manual* (**EA-904**) for more details.

Red Flag: Archaeology and historic architectural evaluations are separate disciplines of cultural resource analysis. Although these are subject to many of the same laws and regulations, they are investigated by discipline-specific SMEs and have unique fieldwork, reporting, and review requirements.

Red Flag: If local public agencies lack the specialized environmental staff to complete this level of evaluation, they shall retain the services of a prequalified environmental consultant. The schedule for completing the documentation shall be determined through consultation among the project team members.

Side Note: Archaeological overviews are planning documents. They are not meant to address Section 106 decision making. As such, they are not coordinated with the SHPO.

IDENTIFY UNDERGROUND STORAGE TANKS/HAZMAT

Underground storage tank (UST) and hazardous materials (Hazmat) impact assessments are conducted to identify where USTs and Hazmat may be encountered during project construction and develop a plan to address potential impacts. Cabinet SMEs or prequalified consultants are responsible for this specialized assessment process.

KYTC may assume liability and responsibility for cleanup if it is necessary to acquire contaminated property. Acquiring contaminated property may increase costs or result in project delays. The PDT must take adequate measures to identify and avoid, when possible, Hazmat and UST sites before initiating final design and plan preparation. Regulated materials, wastes, or contaminants commonly found during transportation projects include soil and water that have been polluted by petroleum products, commercial and industrial solvents, heavy metals, polychlorinated biphenyls (PCBs), and pesticides. Sources of environmental contaminants include USTs, aboveground storage tanks, waste storage areas, and certain commercial and industrial process locations. See the *Environmental Analysis Guidance Manual* (**EA-1002**) for more details.

Red Flag: If these materials are encountered they must be addressed, regardless of a project's funding source. See the *Environmental Analysis Manual* (**EA-1006**).

SOCIOECONOMIC BASE STUDY

A Socioeconomic Impact Analysis evaluates and addresses potential direct or indirect impacts to the human environment. The Socioeconomic Assessment (i.e., Base Study) is normally completed during the early stages of project development. It analyzes potential impacts to the human environment, including the relocation of households or businesses; quality of life issues, such as access to community services, parks, and recreation; and economic considerations, such as businesses and employment impacts. It explores broad issues such as the project's effect on local land use planning or aesthetics. A Socioeconomic Assessment requires a clear understanding of the local context and local values; therefore, much of the assessment is devoted to documenting the existing conditions in the project area.

The Socioeconomic Assessment documents existing social and economic conditions in the project area and evaluates how alternative project scenarios will potentially impact those conditions. If project impacts are identified, the assessment documents how the project can avoid, minimize, or mitigate those impacts. These findings must be considered in the project's overall alternative analysis and selection.

A Socioeconomic Assessment is performed when it is anticipated a federally funded project will potentially result in significant positive or negative social or economic impacts. A standalone Socioeconomic

Assessment is not usually required for state-funded projects or for projects that only call for lower-level NEPA studies (CE for Minor Projects, CE Level 1, or CE Level 2). It should, however, be considered for more complex projects (CE Level 3) and is usually required for projects processed using an EA/FONSI or EIS/Record of Decision (ROD).

See the *Environmental Analysis Manual* (EA-700) for more details.

Red Flag: If local public agencies lack the specialized environmental staff to complete this level of evaluation, they shall retain the services of a prequalified environmental consultant. The schedule for completing documentation shall be determined through consultation among the project team members.

IDENTIFY SECTION 4(F)/6(F) RESOURCES

All Federal-aid projects or projects requiring FHWA approval must be closely examined early in the project development process for potential Section 4(f) and Section 6(f) impacts. The former refers to Section 4(f) of the U.S. Department of Transportation Act of 1966, the latter to Section 6(f) of the Land and Water Conservation Fund Act (LWCFA). All reasonable measures should be taken to avoid such resources regardless of funding source.

Section 4(f) regulations govern the use of property in publicly owned parks, recreation areas, wildlife and waterfowl refuges, and public or private historic sites for federally funded projects. See the *Environmental Analysis Manual* (EA-706 and EA-912) for more details.

Section 6(f) must be addressed when projects result in the permanent conversion of outdoor recreation property that was acquired or improved using LWCFA grant assistance. Conversion of LWCFA property is defined as a change in use to one other than outdoor recreation. Section 6(f) directs the National Park Service (NPS) to ensure that replacement lands of equal value, location, and usefulness are provided as conditions to approve the land conversion. Whenever the conversion of Section 6(f) property is proposed for a highway project, replacement land will be necessary, and the NPS concurrence on the land transfer shall be documented. (In Kentucky LWCFA coordination is administered by the Department for Local Government (DLG)). See the *Environmental Analysis Guidance Manual* (EA-707) for more details.

Section 4(f) typically applies to the Section 6(f) resources.

Red Flag: Many environmental laws — including NEPA — are procedural. This means they establish procedures that must be followed before a decision is made. Section 4(f) is different. It prohibits making certain types of decisions. This type of law imposes a substantive requirement and can block an agency from taking action, regardless of how thoroughly the action has been studied. Under Section 4(f), a federally funded highway project that uses Section 4(f) property can be approved only after it has been determined that no prudent and feasible alternative to use the property exists and that project planning minimizes harm to Section 4(f) sites (49 USC 303).

Red Flag: The coordination requirements of Section 6(f) compliance are complex and time consuming. The agency with jurisdiction over the recreational property may need to be educated on the requirements of the conversion. A KYTC-qualified appraiser is required for the appraisal of Section 6(f) land that is subject to conversion and any selected replacement land. Complying with Section 6(f) also requires close coordination with the DLG and, ultimately, NPS approval.

Side Note: Section 6(f) requirements are applicable to conversion of Section 6(f) land regardless of whether federal funding or approvals are involved.

ECOLOGICAL BASE STUDY/HABITAT ASSESSMENT

Ecological impact assessment is used to identify where unique or critical habitat, endangered species, or water quality may be impacted by project construction and to develop a plan to address potential impacts. The level of effort for assessment must be commensurate with the context and magnitude of anticipated project impacts. Some projects may be located in areas, such as urban landscapes, that do not harbor sensitive terrestrial or aquatic resources. Other projects may occur in areas that require extensive investigations of multiple resources. Early in the process, records research is conducted and, if necessary, followed by field reconnaissance. More detailed studies may be needed to further define areas of concern, quantify potential impacts, and develop plans to mitigate unavoidable impacts.

In the early stages of project development, an Ecological Overview or an Ecological Base Study is conducted depending on project size. For smaller-scale projects (e.g., CE Level 1, CE Level 2, and some CE Level 3), an Ecological Overview is typically sufficient to provide a general assessment of the terrestrial, aquatic, and water quality concerns. Larger projects (e.g., some CE Level 3 and EA/FONSI) will typically require completion of an Ecological Base Study. See the *Environmental Analysis Guidance Manual* (EA-802, EA-803, and EA-805) for details.

The Endangered Species Act (ESA) requires consultation with the U.S. Fish and Wildlife Service (USFW) to ensure actions do not jeopardize threatened or endangered species or their critical habitats. Decisions about alternative locations, construction activities, and letting schedules may be influenced if these species are present. Discussions about these matters should commence as soon as possible after threatened or endangered species or their critical habitats are discovered. After conducting a Habitat Assessment (see EA-804), threatened and endangered species or their critical habitats are documented in a No Effect Finding (see EA-804) or Biological Assessment (see EA-806). These documents are used to meet Section 7 ESA compliance requirements. A Habitat Assessment must be completed as part of the CE documentation.

Red Flag: The season of ecological fieldwork may be an important consideration for investigating certain resources, especially streams, wetlands, and threatened or endangered species. These seasonal requirements should be considered when developing project schedules.

Red Flag: Ecological impact assessment often provides important data needed to complete regulatory processes, such as obtaining water quality permits (see EA-1101) and carrying out Section 7 consultation (see EA-804, EA-805, and EA-806). Schedules for these processes should be considered when developing overall project schedules.

Red Flag: An Ecological Overview or Ecological Base Study provides general information about habitat types, species, or water quality impacts that could result from project activities. However, these studies are not sufficient to achieve compliance with Section 7 of the ESA.

Red Flag: All projects must comply with the ESA regardless of funding source. See the *Environmental Analysis Guidance Manual* (EA-801) for details.

PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

Existing geotechnical information is obtained at the beginning of a project, during the period when the PM collects as much existing data as possible in anticipation of the design phase. The Geotechnical Branch's online database contains results from completed KYTC geotechnical investigations.

Depending on the project context, geotechnical mapping and information beyond what is currently available may be needed. In these cases, preliminary geotechnical overviews are assembled for the project areas or corridors of proposed roadway projects. In this preliminary stage of project development, site conditions are evaluated by doing field reconnaissance of surface conditions and reviewing available surface and

geologic mapping. Other information, such as previous geotechnical studies or investigations, may also be used to supplement the available data.

Geotechnical overviews should address issues that may affect transportation decisions within the project area. They should describe the project area's topography, including its regional and structural geology. Geotechnical overviews should also discuss the impacts of various features and potential mitigation actions — including cost — if the feature is encountered during project work. This information will be used during roadway alternative studies to help determine if a feature should be impacted, particularly in a situation when there are competing issues (e.g., historic, environmental, cultural). Issues that may require discussion include:

- Geologic formations that could complicate or hinder project work
- Presence of springs, landslides, mines, karst, faulted strata, acidic shale, mineral deposits, or other topographic or subsurface features that could affect construction and maintenance of a roadway
- Foundation types for structures
- Possible issues with cut and fill slopes resulting from known soil and rock conditions (That is, how they broadly affect a project area, e.g., flatter or steeper slopes than normal so that the cost impacts of needing more earthwork or right of way can be considered.)
- Possible issues with pavement subgrade and the need for modifying the subgrade
- Seismic zones for earthquake design and possible mitigation actions
- Availability of suitable materials from excavation (i.e., rock from excavation) for use in the subgrade and embankments

Maps of the project areas should include as many of the features noted above as possible. Areas of concern should be clearly noted on the maps. When possible, this information should be provided in GIS (Geographic Information System) layers so they can be incorporated with other features for visual display as well as to aid in determining the recommended corridors. If alternatives are available, an evaluation of each alternative discussing the geologic conditions — both beneficial and adverse — should be included.

Red Flag: Geotechnical investigations furnish information that can be used to identify an optimal design that may generate cost savings while advancing the project to keep it on schedule. They can eliminate the need to be over-conservative (an uneconomical practice used to compensate for lack of knowledge of subsurface conditions) and minimize cases of under-design (and the resulting failures attributed to so-called unforeseen soil conditions). However, bear in mind that any subsurface investigation leaves certain areas unexplored, especially during the early stage geotechnical overview.

Side Note: Whenever possible the geotechnical overview report should be presented in non-specialized language that can be interpreted by a wide audience, as the overview will be included in the reports or other displays made available to the public.

IDENTIFY UTILITY IMPACTS

Locations of existing utility facilities should be identified early in the design process (see entry **LOCATE UTILITIES**). During this process KYTC notifies public and private utility companies of proposed roadway projects and their potential impacts to utility facilities. Once identified, utility companies and the PDT can work to identify conflicts with existing facilities, avoid the facilities or plan for the relocation or adjustment of facilities to a new location on the highway ROW or private easements.

PRELIMINARY JOINT UTILITIES MEETING (IF REQUIRED)

On more complex road projects or projects with a complex network of multiple facilities, during the development of preliminary alternatives more careful attention to detail is needed for utility planning. For

example, on the average small bridge rehabilitation or replacement the District Utility Supervisor and Project Engineer should not invest much time planning utilities. For smaller projects, the recommended utility planning effort most often entails merely identifying existing facilities and conflicts with those facilities. On a major road widening in an urbanized setting with numerous existing facilities, a detailed utility plan should be established. Detailed utility plans show facility locations, SUE notations, identified conflicts, and proposed relocation placements. For more information on utility plan development, see the *Utilities and Rails Guidance Manual (UR-1002)*.

For more complex projects, Preliminary Joint Utilities Meetings may be held early in Phase 1 project development to foster the requisite early and frequent communication between utility owners and the PDT.

IDENTIFY RIGHT-OF-WAY ISSUES

To help the PM understand a project's ROW requirements, potential ROW issues and challenges should be identified. These requirements should be assessed when preliminary alternatives are developed. Establishing the ROW needed for a project is a design process, but one that requires close coordination with other functions which have input into project development and design. Project development must be advanced to a sufficient stage of preliminary engineering design to generally describe a project's ROW need. Once ROW needs have been identified, preliminary ROW cost estimates are calculated. The PM is responsible for preparing cost estimates and must ensure that representatives from the appropriate functional areas are involved in the preclusive ROW determination process. Coordination between staff designing the road and ROW personnel occurs throughout project development to ensure they appropriately address all property concerns.

Red Flag: The most economical means of constructing a project should always be the goal. In some cases, ROW costs are significant. A complex ROW acquisition process can take a long time, delaying construction and increasing project costs. Early identification of potential ROW requirements, approximate costs, and the work effort to complete ROW activities will greatly improve project cost estimates and schedules. Having ROW staff and appraisers participate in the process assists in the development of better project alternatives.

Red Flag: ROW requirements identified during the development of preliminary alternatives should not be considered firmly set. ROW staff cannot perform exhaustive ROW or appraisal activities without significant effort and time.

Red Flag: Highway ROW is often used to provide public utility services and serve conventional road needs. Therefore, utility relocations prompted by a roadway project may require the acquisition of property. For projects that will relocate existing facilities, layout of the proposed ROW should factor into proposed utility designs and provide the ROW needed for construction. Early coordination may be appropriate and aid in the acquisition of parcels critical to utility locations.

Red Flag: Often during highway construction, existing traffic operations are maintained using a temporary diversion on site or by temporarily widening the existing road. Temporary easements are normally required for diversions and road widening. When identifying a project's ROW, the need for temporary easements should be considered.

IDENTIFY RAIL INVOLVEMENT

Any time a highway project can potentially impact a railroad, KYTC must coordinate with the railroad company. This includes projects that are at-grade, over, or under railroad tracks as well as projects impacting railroad-owned property.

Rail coordination is an integral component of project development when a railroad is present. Undertaking railroad coordination activities early in project development fosters effective communication between KYTC and railroad companies and sets the stage for effective project collaboration. The PM may expect the railroad's engineering review/approval of project details and ROW review/approval to occur separately. But individual railroads vary in their approaches. While delays and additional expenses are normal on projects that have railroad involvement, early coordination helps minimize and manage the effects to KYTC's schedule and budget. For example, time-consuming and costly redesign work can be avoided if railroad expansions are planned and the PDT initiates an engineering review in time to adjust a preliminary structure layout. The PM should contact the Railroad Coordinator in the Division of Right of Way, Utilities, and Rail as soon as possible, but no later than selection of the preferred alternative.

When there is early recognition during project development that early rail coordination will be needed, the Railroad Coordinator may be notified. Even while preliminary alternatives are under development and discussion, the Railroad Coordinator can give valuable information to assist in the decision-making process. The Railroad Coordinator can attend the Preliminary Line and Grade Meeting whenever needed and share the following details with designers: railroad requirements, type and number of trains per day, train speeds, railroad company contact information, and an estimate of rail involvement costs for each alternative.

Early involvement of the Railroad Coordinator initiates a field assessment of the project location and enables a comprehensive review of the potential work. How a railroad will be affected by project alternatives — both during and after construction — is considered and may influence which alternative is selected. Railroad factors examined during early rail coordination include but are not limited to track signalization, communications services, track geometry, sight distance issues, and drainage considerations (railroad property). Knowledge of these factors provides the PM and PDT information and feedback concerning potential impacts of alternatives on existing railroads. Proactive coordination will also help the Railroad Coordinator obtain future approvals from the railroad company.

Red Flag: As soon as it is known a project will have railroad involvement the PM should document it in the project database system by adding *Railroad Involvement* to the *Project Concerns* area. This notifies the Railroad Coordinator of railroad involvement on the project.

Red Flag: Data on railroad's location and topography can normally be obtained from regular roadway project mapping. When the railroad's location is critical, additional survey data may be needed (e.g., if drainage is diverted toward the railroad ROW, supplemental data may be needed through the impacted area). To index the railroad to roadway project mapping, the distance to the nearest railroad milepost on each side of the highway centerline must be measured and the information on mileposts recorded. Be aware that railroad companies may require special permits to enter their property for ground surveying. In some cases, railroad personnel may need to escort KYTC surveyors while on railroad property.

Red Flag: Railroad companies have clearance requirements for the construction of permanent or temporary facilities that encroach on or cross the railroad ROW (e.g., road facilities to maintain traffic flow during construction) that. A standard vertical clearance of 23 feet must be provided. Vertical clearance is measured

from the top of the high rail to the lowest point of the structure in the horizontal clearance area of the railroad. Horizontal clearance requirements are established by the railroad company; they are measured from the centerline of track to the face of a pier, abutment, or other obstacle. Contact the Division of Structural Design for clearance requirement information, which can be factored into the study of preliminary alternatives.

Red Flag: All land parcels within the railroad ROW needed for highway construction shall be taken as either permanent or temporary easements. Descriptions must be tied to both highway and railroad stationing.

Red Flag: Highway projects with railroad involvement carry additional costs. To ensure these costs are accounted for in and covered by highway project funding, the PM should request a cost estimate from the Railroad Coordinator. The estimate will cover the provision of railroad-related activities and coordination, including preliminary engineering, final engineering, administration, construction management, and flagging.

EARLY EVALUATION OF PROPOSED ROADWAY ALTERNATIVES AND THEIR IMPACTS ON THE ENVIRONMENT, RIGHT OF WAY, UTILITIES, AND BUDGET

When preliminary alternatives are developed, there are key points at which project decisions must be made. These decision points reflect the process required by NEPA. The *Purpose and Need* statement focuses decision making and is the basis for evaluating and comparing reasonable alternatives. A preliminary *Purpose and Need* statement is drafted during the initial portion of a project's early scoping stages. It is continually evaluated throughout project development and modified as needed based on information collected during Phase 1 – the Preliminary Engineering and Environmental Project Phase.

The PDT develops a range of alternatives within the study area that will fulfill the *Purpose and Need* of a project. Alternatives and corridors evaluated previously should be the beginning point. Those eliminated by development studies do not require further investigation if each alternative was developed adequately with sufficient documentation and a rationale was provided to justify its elimination.

Key existing features within a corridor should be identified and mapped before alternative studies begin. These features may be related to environmental considerations, ROW, or utilities in the area. If it becomes apparent that roadway construction would excessively disturb a key existing feature(s), alternatives may be dropped from consideration with adequate supporting documentation. While a preferred alternative may stand out, the PDT should not make a recommendation until members understand and evaluate all relevant impacts and issues in the study area. As alternatives are removed from consideration, SMEs continue to study and evaluate the remaining alternatives.

SMEs need to adopt a corridor approach, rather than focusing on a given alignment, so that adjustments can be made to avoid or minimize impacts. They also need to remain involved in the decision-making process to ensure impacts are considered and offer suggestions for minimizing or mitigating impacts when necessary. Evaluation of alternatives should also include preliminary information about total project costs. If a detailed SME study of a corridor is cost prohibitive (e.g., archaeology) during the early stages of roadway evaluation, an overview is normally completed to guide the corridor and alignment study. As the alignment development progresses, detailed study may become necessary.

PDT members come from various functional areas in the Department of Highways. Input from these members should be solicited throughout project development. The output from the early evaluation of proposed alternatives and their impacts on the environment, ROW, utilities, and budget is a list of possible, practical, and feasible alternatives that fulfill the *Purpose and Need*. This list of alternatives is further developed and evaluated. As alternatives are developed, they go through a screening process. Alternatives

with impacts on the environment, ROW, or utilities deemed too significant, or which have too great a financial expense, are eliminated.

Red Flag: Properly documenting how and when alternatives are eliminated is an important step in the decision-making process. A roadway's development process may take years and often the people involved in it change. Re-evaluating alternatives that were justifiably eliminated, but did not receive proper documentation, adds unnecessary costs and time.

INITIATE WRITING OF DRAFT ENVIRONMENTAL ASSESSMENT

After reviewing and screening alternatives, SMEs continue to evaluate alternatives still under consideration. Their assessments are guided by the documentation and information produced through base studies and EA activities. A draft EA is begun when preliminary alternatives are being developed.

The primary purpose of an EA is to help KYTC and FHWA decide if an EIS is needed. Baseline environmental studies are typically developed to assess the potential environmental impact of proposed alternatives. The decision-making process is documented by including results from the baseline studies as well as engineering and economic considerations. At the conclusion of this process, KYTC and FHWA determine whether the final documentation should be a CE, FONSI, or EIS. The document oftentimes — but not always — identifies the preferred alternative.

The PDT, in consultation with the Division of Environmental Analysis and FHWA, establishes the level of effort needed to determine the range of alternatives as well as the studies necessary to complete an adequate assessment. The Environmental Project Manager, DEC, or a prequalified environmental consultant documents the decision-making process. The EA discusses a reasonable range of alternatives for the proposed action, including the no-build option and alternatives that were considered but eliminated.

If impacts exceed CE thresholds but are not deemed significant, the process may advance by finalizing the EA, soliciting public input at a public hearing, and preparing a finding of no significant impact (FONSI).

Red Flag: KYTC and FHWA use the EA to determine if an EIS is needed. The scale of the project impacts and other factors (e.g., project controversy) are considered. If the Division of Environmental establishes that impacts are significant, it prepares an EIS.

ALTERNATIVE STUDY, SCREENING, AND SELECTION

The study, screening, and selection of alternatives can require the PM and PDT to undertake significant investigation and analysis to identify a reasonable range of legitimate, competitive alternatives that meet a project's *Purpose and Need*. The range of alternatives must include at least one option that meets the scope, budget, and timeline of the *Highway Plan*. To meet the purpose and need and qualify as a reasonable and competitive alternative, concepts should be developed with attention to engineering and fiscal constraints. Alternatives should also fulfill the operational, safety, and other performance goals outlined in the *Purpose and Need* statement.

Study and screening are used to refine alternatives and produce a list of possible, practical, and feasible options that fulfill the *Purpose and Need*. The study area and preliminary project costs should be defined for each alternative. While a preferred alternative may stand out, the PDT should not make a recommendation until all alternatives have been adequately explored and the impacts and issues surrounding each are understood. As the review process of alternatives progresses, SMEs continue to evaluate alternatives which remain under consideration, and work with the PM and PDT to eliminate those which no longer seem reasonable.

As a rule, if an alternative does not satisfy the *Purpose and Need* for the project, it should not be included in the analysis as an apparent and reasonable alternative. There are times when an alternative that is not reasonable is included (e.g., when another agency requests inclusion due to public expectation). In such cases, it should be clearly explained why the alternative is not reasonable (or prudent or practicable), why it is being analyzed in detail, and why it will not be selected. Among the alternatives, there must be one no-build alternative and another whose project estimate is at or below the approved *Highway Plan* budget.

The output from the alternative study and screening phase may include the draft environmental document (e.g., EA or CE), preliminary alternative plans (including temporary traffic control measures and possible detours), ROW and utility impacts with associated costs, possible mitigation measures, and corresponding project costs and schedule impacts.

Studying and screening alternatives helps the PM and PDT select a preferred alternative based on environmental, economic, engineering issues, and public input. Alternative selection is the final key decision point of shared transportation decision making in a project's conceptual stage. The final environmental document is then prepared, reviewed, and approved. The output is the approved environmental document and the selected alternative, which progresses to final design. The *Highway Design Guidance Manual (HD-203.3)* summarizes issues to consider when developing alternatives.

PUBLIC INVOLVEMENT

A main objective of public hearings or meetings during the latter stages of project development is to let community members examine, review, and comment on the details of preferred alternatives. The opinions voiced at late-stage meetings are important considerations when selecting an alternative. Public meetings at this juncture are also used to discuss how issues or concerns brought up at a previous meeting can be resolved, particularly challenges related to environmental commitments.

PUBLIC MEETING #2 & STAKEHOLDER MEETING #2

Once the PDT has developed a reasonable number of feasible and competitive alternatives and understands the potential impacts of each, it may be appropriate to hold another public meeting or stakeholder meeting to present those alternatives and gather public/stakeholder opinion. This meeting may be held before or after identifying a preferred alternative.

Stakeholder engagement helps the PM and PDT better understand conditions in the project area. Members of stakeholder groups may come from a variety of backgrounds (e.g., local officials, emergency services, school transportation and/or administration, utility owners impacted). The composition of stakeholder groups should be tailored to address the needs and context of each project. Often stakeholder groups continue to meet periodically to receive updates and project-related information from the PDT. If the PDT decides more direct involvement with stakeholders is needed, the PDT may engage a subset of the stakeholder group through a focus group.

For more information on public meetings, see the *Highway Design Guidance Manual (HD-604)*.

REVIEW, SUMMARIZE, & ADDRESS PUBLIC COMMENTS

After conducting public involvement activities, public opinions are documented, reviewed, and considered within the broader project context. Public involvement efforts help the PM and PDT identify and document the community's concerns about the project. After meeting with the public, the PM and PDT should prepare a written summary that describes aspects of the community (e.g., social, economic, and political structures) as well as the key issues voiced by members of the public. Close attention should be paid to special sensitivities, requests, and/or requirements community members advance. After examining public meeting records, the PM (assisted by the PDT) should address public comments and give feedback to the community where they judge it appropriate to do so. The PM and PDT should also develop plans — if necessary — for

resolving issues so the project can move forward. If a significant amount of time elapses between the public involvement meetings and project letting, consider updating the public through media, newsletters, websites, or other means as appropriate.

PROJECT TEAM MEETING AND ALTERNATIVE REVIEW

Following Public Meeting #2 and the close of the public comment period, the PDT may meet to discuss the comments received, formulate responses, and review the preferred alternative. If the preferred alternative is reconfirmed, the draft EA is compiled.

IDENTIFY AND STUDY ADDITIONAL ALTERNATIVES (IF REQUIRED)

Based on comments or additional information received, the PDT may need to study further alternative combinations, crossovers, or new alignments. New solutions must be evaluated at the same level of detail as previous alternatives before a final alternative selection is made. Supplemental field investigations of the preferred alternative (e.g., biological assessments, Phase I or Phase II archaeological investigations) may also be necessary before identifying the selected alternative.

If a new alternative(s) appears promising (e.g., achieves the *Purpose and Need* at a lower cost or with fewer impacts), the PM and PDT should discuss and then decide whether more time should be allocated to investigate it and collect relevant information. When deciding if a new alternative should be examined late in Phase 1, the PDT must consider the project schedule and milestones. A new alternative that reduces impacts may simplify and compress the Phase 2 schedule, affording time for study while still meeting the targeted letting goal. If studying a new alternative will require more design funding or time, the decision should be coordinated with the CDE and Central Office to obtain their approval.

SOLUTION SEEKING: AVOIDANCE, MINIMIZATION & MITIGATION OF IMPACTS

During the preliminary design phase, it is imperative that potential constraints, issues, and solutions be identified as early in the process as practical, so the best solution can be developed. Understanding the magnitude of environmental, ROW, utilities, and budgetary impacts associated with each alternative is integral to the progression of alternatives analysis and the shared transportation decision-making process. SMEs should present the results of their investigations of each alternative studied to the PDT. The PDT should be provided information on environmental baseline studies and the corresponding impacts, early identification of potential ROW requirements (with approximate costs), and conflicts with existing utilities.

Environmental SMEs should offer suggestions on the risk(s) associated with each alternative and the expected timeframe for resolving impact issues (e.g., Section 4(f) involvement that could take an additional 12 months to resolve, stream mitigation that would cost hundreds of thousands of dollars, or impacts to endangered species habitat). ROW and Utility SMEs should present their findings so the PDT can fully consider the possible impacts that property acquisition and utility location might have on the transportation decision (e.g., sensitive ROW which will result in a complex taking or conflict with a significant existing utility that will take a long time to resolve).

If SMEs uncover subsequent information that could significantly impact a project's budget or schedule, this should be communicated to the PM without delay so they can give due consideration to the new information. When determining impacts, the PM and PDT must work through the decision-making process and identify steps to avoid, minimize, or mitigate the impact. In some cases enhancement efforts should be considered as well. The PM and PDT must always consider issues pertaining to the environment, economics, and engineering. The PDT can also make a decision or determine that additional information is required to further investigate alternatives. Based on the impacts and issues associated with each alternative, the PDT should discuss and identify a preferred alternative.

Specifically, the PDT will need the following (at minimum) to aid their comparison of alternatives and selection of the preferred alternative:

- Preliminary alternative plans
- ROW and utility impacts with associated costs
- Potential mitigation measures
- Corresponding project costs and schedule impacts

All decisions are documented (usually in written meeting minutes the PDT reviews and approves) and included in the draft environmental document and the draft Design Executive Summary (DES).

When the PM, in consultation with the PDT, determines public and resource agency involvement have been sufficient, the PDT may identify a preferred alternative in the environmental document before conducting the public hearing. A selected alternative may not be chosen prior to the hearing.

PRELIMINARY LINE AND GRADE/IDENTIFY SELECTED ALTERNATIVE SOLUTION SEEKING: AVOIDANCE, MINIMIZATION & MITIGATION OF IMPACTS

After SMEs have studied the project's range of alternatives, the PDT should meet to select a preferred alternative. An assessment of the social, economic, and environmental impacts of a proposed action or project informs the PDT's deliberations and helps members identify their preferred alternative.

At the Preliminary Line and Grade Meeting PDT members discuss reasonable alternatives for the proposed project. The primary goal of Preliminary Line and Grade Meeting is to select a preferred alternative and document the rationale for the decision. SMEs present results of their investigations to the DEC, who, in turn, presents to the PDT. For example, environmental SMEs will describe how each alternative will impact the study area's environment. For each alternative, SMEs will discuss impacts, summarize impact mitigation, and provide a time frame for resolving issues which have been identified. PDT members with construction expertise will assist with evaluating temporary traffic control and construction phasing for each alternative. During these assessments, the PDT discusses requisite diversions, including their construction and ROW cost estimates. Construction experts judge whether the proposed ROW is sufficient based on issues such as equipment access, construction phasing, and *Manual on Uniform Traffic Control Devices* (MUTCD) requirements. ROW and Utility agents should also present their findings during this meeting so the PDT may fully consider the possible impacts of property acquisition and utility location on the transportation decision.

When determining a preferred alternative, the PDT must work through the decision-making process for highway projects. This includes avoidance, minimization, mitigation, and possibly enhancement of each alternative's impacts. Decisions are recorded in NEPA documentation and the DES. Guidance for creating these documents is found in the *Environmental Analysis Guidance Manual* and the *Highway Design Guidance Manual*, respectively.

The PM and PDT use available data, analysis, and professional judgment to select the preferred alternative.

Red Flag: For some alternatives, problems related to the maintenance of traffic and constructability may be insurmountable. It is critical to examine these issues when developing alternatives.

EVALUATE NEW ALTERNATIVES (IF REQUIRED)

It is possible — especially on more complex projects — for new alternatives to surface late, even as the end of Phase 1 seems imminent. If the new alternative(s) looks promising (e.g., achieves the *Purpose and Need* at a lower cost or with fewer impacts), the PM and PDT may determine that additional information

and time are required to investigate it. Consideration must be given to the project schedule and milestones when deciding to examine new alternatives late in Phase 1. However, a newly discovered alternative that reduces impacts may simplify and compress the Phase 2 schedule, affording time for study while still meeting the targeted letting goal. The PM and PDT should discuss and determine whether the new alternative merits further examination. If looking at the new alternative will require more design funding or time, the decision should be coordinated with the CDE and Central Office for their approval.

COMPILE DRAFT ENVIRONMENTAL ASSESSMENT

As alternatives are eliminated and selection of a preferred alternative grows imminent, the draft EA is compiled for submission, review, revisions, and approval. The EA must:

- Describe the proposed action,
- Detail the purpose and need for the proposed action,
- Describe alternatives,
- Evaluate the impacts associated with each alternative,
- Discuss proposed mitigation,
- List the agencies and persons consulted during early coordination, and
- Discuss the preferred alternative if the PDT has identified one.

INITIATE DRAFT 4(F) STATEMENT

If the project has a Section 4(f) evaluation, a draft Section 4(f) statement is included in the draft EA. The submission, review, and term of the Section 4(f) evaluation follow that of the NEPA document, which it is part of.

ENVIRONMENTAL ASSESSMENT APPROVAL

The EA compiles all information gathered for the project, including completed base studies. The EA should:

- Describe the proposed action in sufficient detail;
- Discuss the purpose and need for the proposed action;
- Review all alternatives;
- Catalogue environmental, social, and economic impacts;
- Record the secondary and cumulative effects of the proposed action for each alternative;
- Document proposed mitigation measures; and
- List the persons and agencies consulted during the early coordination process.

Once the draft EA is completed and approved by FHWA, the opportunity for a public hearing may be advertised.

SUBMITTAL, REVIEW, REVISIONS, & APPROVAL

The environmental SMEs responsible for preparing the EA generates the appropriate number of copies of the draft EA and submits them to the Division of Environmental Analysis and DEC for review. The Environmental Project Manager (EPM) establishes the schedule for document review and comment. The DEC coordinates document review with the PM and other appropriate district personnel and forwards comments from the review to the EPM for inclusion with comments from the Division of Environmental Analysis. The Division of Environmental Analysis manages the overall review of the draft EA; it also prepares and compiles comments, questions, or required modifications.

Following review, the draft EA is revised to address comments or resolve outstanding issues. Copies are then prepared and submitted to the Division of Environmental Analysis and DEC for final review and acceptance. The number of document copies should comply with the NEPA document distribution table

(see the *Environmental Analysis Guidance Manual* [EA-9026]) or the decision made during project scoping. The EPM establishes the schedule for document review and comment following the same process used for draft EA review.

Once KYTC accepts the EA, the Division of Environmental Analysis submits a copy to FHWA for approval. This is the first opportunity FHWA officials will have to review and comment on the EA. FHWA notifies the Division of Environmental Analysis of comments or issues identified during its review. The EPM coordinates the revision process to ensure outstanding concerns are addressed and resolved to the satisfaction of FHWA and KYTC.

Once the review phase is complete, the final EA is signed and approved by the Director of the Division of Environmental Analysis and the Administrator of the Kentucky Division of FHWA.

PUBLIC HEARING

On Federal-aid projects whose environmental document is an Environmental Assessment/ Finding of No Significant Impact (EA/FONSI) *or* an Environmental Impact Statement (EIS), KYTC must 1) give the public an opportunity to request a public hearing, or 2) hold a corridor and/or design public hearing. Federal regulations mandate this course of action. For instance, if KYTC recently held a public meeting for an EIS level project and prepared an adequately detailed public hearing summary, the most appropriate course of action may be to advertise an *Opportunity to Request a Public Hearing* because the likelihood of collecting additional substantive information is small. However, if the advertisement generates sufficient interest, the Cabinet must hold another public hearing.

The primary objectives of a public hearing are to circulate detailed project information for public review and comment and to discuss how issues and concerns voiced during earlier meetings have been resolved, especially those pertaining to environmental commitments. Public hearings afford interested citizens, stakeholders, and public officials the opportunity to participate in the transportation decision-making process. For more information on public hearings, see the *Highway Design Manual* (HD-603).

Red Flag: A public hearing should be held no later than 60 days after the District is advised that an EA has been approved.

Red Flag: Public hearings are more regulatory in nature than public meetings. KRS 13B and KRS 174.100 describe procedures for holding a public hearing or offering the opportunity to request a public hearing on state-aid projects. On Federal-aid projects, procedures must be consistent with the public involvement/public hearing program requirements outlined in 23 United States Code 128 and 40 CFR 1500-1508 and 23 CFR Part 771. Guidance on public hearing format and requirements may be found in the *Highway Design Manual* HD-603.

PUBLIC HEARING RECORD

A hearing record is used to document public hearings. Any public hearing record is considered an open records document and therefore must contain the material provided for public review and comment as well as the responses to that material. Public responses may include:

- Written statements or petitions offered during the public hearing or during the identified comment period following the hearing, and
- Oral statements made during the public hearing through a court reporter or recording device.

After the hearing record has been prepared, the original remains in the District Office. The Public Involvement Coordinator receives copies of the hearing record and distributes it, along with a summary/recommendation, to the proper agencies. Federal regulations specify that KYTC must submit a

copy of the hearing, along with the certification and record transcript, to FHWA. Additionally, copies are provided to: 1. KYTC Division of Environmental Analysis (hearing record and summary/recommendation), 2. KYTC Division of Planning (summary/recommendation only), and 3. KYTC Division of Right of Way and Utilities (summary/recommendation only).

PREPARATION OF DRAFT FINDING OF NO SIGNIFICANT IMPACT (FONSI) DOCUMENT

The FONSI summarizes environmental decision making for the project location. Pursuant to 40 CFR Part 1508.13, the FONSI reviews why project activities will have no significant impact on the human environment, therefore precluding the need for an EIS. The FONSI focuses on the selected alternative and provides responses to issues raised during the public hearing. The EA is attached to the FONSI, and it provides supporting documentation for the decisions made in alternative selection. The draft FONSI includes the following items:

ENVIRONMENTAL JUSTICE RESOLUTION

A project review ensures actions resulting from transportation decisions will not have disproportionately severe and adverse effects on minority and low-income populations. If such impacts are unavoidable, proposed measures to minimize or mitigate them are summarized, including a discussion of how the affected populations participated in the decision-making process.

FINAL SECTION 4(f) STATEMENT

The FONSI includes findings on Section 4(f) eligibility and effects determinations. Supporting documentation is included in an appendix. If an individual 4(f) is necessary, that information is also included.

SECTION 106 MEMORANDUM OF AGREEMENT (MOA)

For CE-level projects, KYTC's programmatic agreements address Section 106 concerns. In the case of larger projects (e.g., a FONSI project), a full baseline survey would likely be conducted. The MOA should include measures to resolve adverse effects – specifically the avoidance, minimization, and mitigation of those effects.

SECTION 6(f) CONVERSION

Resolutions to Section 6(f) impacts are summarized.

ARCHAEOLOGY

Results from Phase I and Phase II archaeology investigations are included.

Red Flag: Environmental Justice Analysis (EJA) might correspond with the Socioeconomic Impact Assessment, but the EJA requirements are separate and outlined by an Executive Order.

Red Flag: For historic bridges, KYTC and FHWA document the process using the Programmatic 4(f) for Historic Bridges Checklist. The FONSI appendix contains the final checklist as well as the MOA addressing impacts to the bridge.

Red Flag: If archaeological investigation is incomplete when the draft FONSI is prepared, an MOA may be necessary. The MOA documents KYTC's commitment to perform the work later in the project life.

RIGHT OF WAY TITLE REPORTS (IF REQUIRED)

When KYTC acquires ROW for a project, the historical chain of property title is documented and submitted on a title report. This search looks at historical property ownership. The source of each title is obtained by contacting property owners and searching the county clerk's records. ROW acquisition and supporting activities normally occur during Phase 2. However, it may be advantageous to start title report work at the

end of Phase 1. Other ROW activities that can begin at the end of Phase 1 include starting development of the ROW project report and compiling relocation worksheet data. When ROW plans have been developed to a stage that it is possible to identify encroachments on the existing ROW, ROW title reports may be gathered. If the PM and ROW supervisor believe ROW title reports may be difficult to complete, securing title reports as a preliminary ROW activity may save time later in Phase 2. Directions for requesting title reports is provided in the *Right of Way Guidance Manual (ROW-403-2)*.

If the duration of project development prevents ROW from being completed in a timely manner, title reports created during Phase 1 may require updates. Work done on title reports created as a preliminary ROW activity is nonetheless valuable since the historical information documented is valid and only recent property ownership (covering the time frame since the title report was completed) needs to be examined.

Side Note: Title reports usually record historical title information dating back a minimum of 35 years. The Division of Right of Way, Utilities, and Rail will work with PMs if a longer history is needed (e.g., the property owner has owned the property for more than 35 years, or if the owner acquired the property as the beneficiary of a will.)

Red Flag: Property may not be acquired under preliminary ROW activities. Acquisitions do not begin until authorized by the Director of the Division of Right of Way, Utilities, and Rail.

DRAFT AND SUBMIT DESIGN EXECUTIVE SUMMARY AND DESIGN EXECUTIVE SUMMARY APPROVAL

At the end of Phase 1 — typically after the Preliminary Line and Grade Meeting and identification of the selected alternative — a DES is drafted and submitted to the Division of Highway Design. The DES is the record of engineering decisions related to the project. It contains the rationale used to justify the preferred alternative and requested design exceptions. Projects administered by the Division of Highway Design require a DES unless the Division Director grants an exemption. The Division of Highway Design uses this information as a record of the project and in determining approval of design exceptions. The Division of Environmental Analysis uses the DES to identify required environmental actions.

Since the DES outlines the rationale used to make design decisions, it is important for the DES to contain all pertinent information used in the decision process. Information on DES contents, approval processes, and examples may be found in the *Highway Design Guidance Manual (HD-203.6)*. DES forms are available on the Division of Highway Design Intranet webpage.

Red Flag: The DES approval process is tiered so that more complex projects require review and approvals. For example, final DES approval on the most complex projects requires signatures from the Location Engineer, Roadway Design Branch Manager, and Director of the Division of Highway Design. As project complexity increases, the time required for DES review and approval increases as well.

Red Flag: On FHWA oversight projects (Projects of Divisional Interest [PODIs] and Projects of Corporate Interest [POCIs]), the DES must be provided to FHWA, and their approval for design exceptions must be solicited separately from Division of Highway Design approvals. FHWA approval of design exceptions are included in the project record.

FONSI/ NOTICE OF AVAILABILITY (NOA)

During the FONSI process — which encompasses submittal, review, revisions, and approval — the EPM coordinates revisions to attain final approval from FHWA and KYTC. Review status is tracked in the Environmental Analysis Tracking System (EATS) database, which is accessible to the DEC. FHWA signature approval of the FONSI constitutes location approval of the selected alternative.

To inform the public of the decision, the PM publishes a Notice of Availability (NOA) in media outlets they believe are best suited to reach a wide audience (e.g., newspaper, internet, other innovative venues). The NOA announces that project documentation is ready for review and comment. Projects requiring an EIS or a FONSI are advertised in local or regional newspapers. For projects of statewide significance, the CDE, regulatory, or management personnel may ask to advertise a public hearing in a newspaper of statewide circulation.

FINAL DESIGN

Once an alternative is selected and the transportation decision is documented, the project moves into the Final Design Phase (i.e., Phase 2). The final design must preserve resolutions to project-specific issues or special circumstances identified in preliminary design. Details prepared for the selected alternative in the Final Design Phase are used to develop plans for ROW acquisition, utility relocation, and construction.

PHASE 2 DESIGN FUNDING REQUEST

On larger projects, project development is commonly broken into two phases. Larger projects require greater project definition through the Preliminary Engineering Phase to understand the type and amount of work needed in the Final Design Phase. For these projects, the PDM initially requests sufficient funding to complete preliminary engineering and environmental work. After a transportation decision is made and adequately documented, the PDM requests additional funding for the final design. Phase 2 requests are dealt with in the same manner as initial Design Funding Authorizations.

Red Flag: Design Funding Authorization may take several months once the initial request is submitted, especially at the beginning of a new biennium and new *Highway Plan*. The Central Office's organizational planning prioritizes projects based on risk, funding, and KYTC's strategic plan. When multiple Design Funding Requests are submitted, the PDM should communicate the projects' needs and the risks to the Central Office to assist with project prioritization. For time-sensitive projects (e.g., those whose on-time delivery are placed at risk if an activity on the critical path does not begin on time), the PM should communicate to Program Management the need for an expedited Design Funding Authorization process. FHWA must approve funding requests on Federal-aid projects, which adds review time.

Red Flag: Sometimes FHWA requires a final, approved NEPA document before it will authorize a PR-1 form to allocate additional federal funds for Phase 2 design.

CONTRACT MODIFICATION TO PHASE 2 DESIGN

When additional phases of work are added to the scope of a project on which consultant services are used for project development, the contract must be modified and the schedule adjusted. The Division of Professional Services assists the PM with contract modifications. A contract modification is negotiated using the same procedure as the original contract.

The Division of Professional Services webpage contains helpful tools and guidance, including the *Professional Services Guidance Manual*. See also the *Highway Design Guidance Manual (HD-205)*.

Red Flag: Contract modifications go through a review process that is similar to the review process used for the original contract. The Division of Professional Services finalizes the contract and sends it through KYTC's approval process. When the Division of Professional Services receives eMARS approval (indicating the contract has been automatically filed with the LRC Government Contract Review Committee) the Division sends a notice to proceed and approval for payment to the firm, which indicates it may begin work and bill for services.

ENVIRONMENTAL APPROVAL

A critical step in the Federal-aid process is obtaining environmental clearance (e.g., the completion and federal approval of an environmental document for the proposed project). An environmental document records the project decision-making process and the evaluation and selection of project alternatives, including consideration of engineering, environmental, and economic factors. Normally, development and approval of the environmental document occur in Phase 1. The NEPA documents and alternatives analysis should clearly indicate why and how the range of project alternatives was developed, including the public and agency input used. In addition, alternatives analysis should explain the rationale for eliminating alternatives from consideration. This analysis must describe the criteria used to eliminate alternatives, when during the process alternatives were removed, who participated in establishing criteria for evaluating alternatives, and measures for assessing the effectiveness of alternatives.

Pursuant to NEPA, federal regulations identify three forms of NEPA documentation: 1) CE, 2) EA and FONSI, and 3) Draft EIS and Final EIS and ROD. The form of documentation is chosen based on a project's scope, scale of impacts, complexity, and potential for controversy.

CEs are processed as one of four types or levels. The appropriate type or level depends on project context and the magnitude of impacts. Projects with little to no impact are processed using either a CE for Minor Projects or CE Level 1. Projects with greater environmental impacts may be processed using a CE Level 2 or CE Level 3. The *Environmental Analysis Guidance Manual (EA-404)* describes the criteria established for different CE levels.

FHWA approval is not required for state-funded projects. For these projects, environmental resources are typically documented in an EO. Depending on its context, state-funded projects may require an approval or permit from another federal agency that is subject to NEPA requirements. Examples include USACE permits, USCG permits, and easements on the purchase of federally owned property or from within federally designated lands (e.g., Daniel Boone National Forest). These agencies prepare their own NEPA document using project information supplied by KYTC.

See the *Environmental Analysis Guidance Manual (EA-400)* for guidance on the preparation of environmental documents. PMs may wish to also consult supporting information in the *Highway Design Guidance Manual (HD-400)*.

The time needed to create different environmental documents (and the associated work required for their preparation) varies greatly. Once finalized and accepted, approvals of these documents are valid for a specified time frame. If an approval expires, a reevaluation is needed. The purpose of the reevaluation is to ensure the decision reflects the current project and verify the effects and impacts previously identified have not significantly changed. Irrespective of any document's expiration date, reevaluation may be warranted if there are changes in the project scope, regulations, or conditions within the project area. Additionally, before the advancement of a Federal-aid project to any major phase (ROW, utilities, construction), FHWA may require reevaluation of the approved NEPA document.

The following table provides general guidance on when each document type is appropriate, who prepares it, time required for completion, and how long the document is valid before a written reevaluation is required. The table indicates the reference chapter in the *Environmental Analysis Guidance Manual* where guidance for these environmental documents is found.

NEPA Document Types

Document Type	When to Use	Who Prepares	Time to Complete	Valid for
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EO (EA-403)	Planning phase or state-funded projects	KYTC Planning or Environmental Staff or Consultant	2-12 months	N/A
CE (EA-404)	When impacts are not significant (See CE Manual)	KYTC District or CO Environmental Staff or Consultant	Varies. See below.	2 years
<ul style="list-style-type: none"> • <u>CEMP</u> development may require a few days or two to three months. • <u>CE Level 1 documentation</u> typically requires 2-6 months. • <u>CE Level 2 or 3 documentation</u> typically requires 6-24 months. 				
EA (EA-405)	When unsure whether impacts will be significant or not	Typically, Consultant	6-18 months	Until final environmental document is completed
FONSI (EA-406)	When an EA finding results in no significant impacts	Typically, Consultant	6-12 months after EA	2 year
EIS/FEIS (EA-407, EA-408)	When impacts are anticipated to be significant	Typically, Consultant	24-36 months	Until ROD is signed
ROD (EA-409)	When impacts are significant	Typically, Consultant	6-12 months after FEIS	3 years
Re-evaluation (EA-410)	Expired document, plan changes, or changes in regulation	Manager of Original Document (EPM or DEC)	1 week – several months	Same as original document

Red Flag: Project changes which occur after an environmental document is approved must be clearly communicated to all project team members so that project environmental documents are updated properly. This includes minor revisions to the project footprint resulting from detailed design at intersections, definition of approaches, changes in slopes, or other refinements that minimally expand the area impacted by a project. When substantial additional impacts are identified or the project area is significantly expanded after completion of the environmental document (e.g., the incorporation of excess excavation sites), it may be appropriate to reevaluate the environmental document and prepare a supplement or addendum, regardless of scheduled project development phases.

Red Flag: The PM is responsible for initiating a reevaluation if the approved NEPA document, or its subsequent reevaluation, will expire prior to required authorization of a major phase, or if there has been a significant change (e.g., in scope, regulation, project area) in the project since the NEPA document was

approved. Reevaluation must be initiated sufficiently in advance of any scheduled major phase authorization to allow for completion of additional studies, coordination with resource agencies, and other activities. (Starting a reevaluation is especially critical as the project progresses toward construction to ensure letting is not delayed). Generally, the office which developed the original document is responsible for reevaluation. For CE on minor projects and CE Level 1 documents developed in a District Office, the DEC coordinates and/or completes the reevaluation. For other document types developed by the Division of Environmental Analysis or consultants, the Division coordinates and/or completes the reevaluation. In some cases, environmental consultants may play a role in preparing reevaluation documentation.

Red Flag: All state-funded projects, regardless of federal involvement or permitting, must comply with the ESA. Regardless of funding source, other environmental factors, such as USTs, relocations, hazardous waste or cleanup sites, and noise, must be considered. For state-funded projects with federal agency involvement, a NEPA document is not typically required. However, project development must be consistent with NEPA requirements, including an analysis of alternatives, and compliance with Section 106 of the National Historic Preservation Act and the ESA.

PHASE 2 FINAL DESIGN

FINAL DESIGN

Detailed plans and documents needed for ROW acquisition, utility relocation, permitting, and construction of the selected alternative are produced during final design (i.e., Phase 2 design). Resolutions for project-specific issues or special circumstances identified in the preliminary design phase must be reflected in the final design.

When activities in one subject-matter area influence work in another during final design, an iterative approach should be adopted during the revision process. Work between subject-matter areas can and should overlap. During this phase, the PM relies on the critical path schedule to target work situated on the critical path and to identify strategies to keep the project moving forward.

Red Flag: The PM benefits from having an organized system to track and retain files. Throughout project development — but especially during the final design, ROW, and utility phases — updates are made frequently and organizing materials in a straightforward manner is critical.

Red Flag: Composition of the PDT might not remain constant from Preliminary Design to Final Design. When changes to the project team happen, the group needs the PM and/or other PDT members with a history of working on the project help to adjust and coordinate their work effectively. Sometimes the composition of the PDT changes as members depart from the team. To preserve momentum during project development in the event of staff turnover, it is imperative to maintain exhaustive yet clear project documentation. This is non-optional — it must be done.

LOCATE UTILITIES SUE QL A OR B (IF REQUIRED)

If SUE Quality Level A or B has not been completed for the project, the PM and PDT may find that this information is needed during final design. SUE Quality Level A or B may be thought of as an activity performed during the utility phase, unless the potential impact is sufficient for the PDT to potentially consider a redesign. Examples of utilities that may prompt a redesign include large gas transmission lines, water mains, buried fiber optic cable, and other facilities whose relocation will result in costs or delays disproportionately large compared to the overall project budget and schedule.

Even if a utility relocation is not reimbursable (i.e., direct costs will not impact the project budget), the PDT may elect to avoid it if the relocation work significantly impacts the overall project schedule.

The PM has options to acquire Quality Level A detail. Using a letter agreement for statewide surveying services may be faster than waiting for a modification to the original consultant contract.

DRAINAGE DESIGN

A proposed drainage plan for the selected alternative includes culverts and headwalls, inlets and storm sewers, bridges, temporary drainage, and project-specific drainage needs. Proposed drainage plans must contain economical and hydraulically feasible solutions that comply with KYTC's policies, specifications, and standards.

Once the drainage design meets the PDT's expectations, all relevant information is placed in a drainage folder. The folder format facilitates the organization of documents as well as the review process. The PM provides the drainage folder to the Central Office. Drainage folders are required on all projects that:

- Contain major drainage structures, including structures used to transport water directly through, or which delay the flow of water into or away from, the highway system; or
- Include extensions of existing structures or improvements to those structures or drainage systems.

The Division of Highway Design uses two drainage folders: *preliminary* and *final*. Typically, *preliminary* drainage folders are not required unless bridges, bridge-sized culverts, storm sewers, or major channel changes are among the drainage features. A third folder — the *advance situation* folder — is primarily used by the Division of Structural Design. The *Highway Design Guidance Manual (HD-204.13 and HD 204.20)*, *Highway Design Drainage Manual (DR-300)*, and *Division of Structural Design Guidance Manual (SD-200)* contain detailed instructions on procedure and format.

A drainage inspection meeting — which the PM is responsible for scheduling — is held for each project. It is often combined with the Final Joint Inspection meeting, with comments on drainage design being incorporated into the meeting minutes. If a project or the drainage design are complex, a separate drainage inspection meeting may be held. Whether the drainage inspection meeting is combined with the Final Joint Inspection meeting or held independently, its purpose is to review material submitted in the *preliminary* folder and let SMEs ask questions about elements of the submittal they are unclear on.

A separate drainage inspection report is prepared when a drainage inspection meeting is held, or if the PM deems it appropriate. Regardless of how minutes are documented, discussions on drainage design are placed in the drainage inspection report. This report summarizes written comments from SMEs on the drainage design as well as the responses from the PM and/or drainage designer. It also documents that all personnel concur with the final drainage design (including modifications made based on SME reviews of the initial design). When project plans call for using larger drainage designs and features, the drainage inspection report recommends location, span arrangement, abutment type, and the sounding layout for drainage structures, piers, and abutments. The drainage report also documents if scour analysis is needed, which is determined during the geotechnical investigation. The PM must ensure the report includes the Central Office Drainage Engineer's endorsement of the drainage inspection meeting minutes and comments.

The *final* drainage folder includes recommendations from the review process and serves as the permanent record of the project drainage plan. It contains all of the required information to support the selection of drainage items proposed in plans, and it documents final resolution(s) of drainage inspection comments. In the event of flooding and subsequent lawsuits by plaintiffs whose properties were damaged by high water, the *final* drainage folder contains the materials KYTC will cite as evidence to justify and defend its decision making. Variations of current practices and standards incorporated into the drainage plan are fully documented in the *final* drainage folder.

Red Flag: The *advance situation* folder is treated as an order form that instructs the Division of Structural Design to either begin structure design or to direct a consultant to begin this work on KYTC's behalf. The *advance situation* folder should contain explicit requirements identified by the PDM and PDT project team.

Red Flag: The installation of drainage structures can present significant challenges related to constructability and maintenance of traffic (MOT). Of particular concern are pipe culverts with either little cover or extraordinarily deep cover heights. The PM may consult with staff possessing construction expertise to identify strategies that minimize cost and project delays during later work phases.

Red Flag: Many local governments have ordinances, codes, guidelines, or other requirements that influence roadway drainage design for projects in their jurisdiction. KYTC pursues additional coordination with local governments that have specific drainage criteria, including the Louisville and Jefferson County Metropolitan Sewer District (MSD) and Lexington-Fayette Urban County Government (LFUCG.) Consult the *Drainage Guidance Manual* and drainage staff for assistance.

PAVEMENT DESIGN

Designing the pavement structure to support the traffic load and distribute it to the roadbed requires the PDT to draw on resources from the Division of Planning, the Division of Structural Design's Geotechnical Branch, and the Pavement Branch of the Division of Highway Design. With the support of these KYTC staff, the PDT documents the project-specific conditions and decisions made in the pavement design process.

The Pavement Branch develops pavement designs and engineering analyses for all projects on the National Highway System (NHS) and projects having at least 20 million equivalent single axle loads (ESALs). For other projects, the PDT performs all project-related design activities including pavement design, engineering analysis, and documentation. Specific submittal and approval responsibilities are listed in the *Highway Design Guidance Manual (HD-1001.3)*. Pavement Branch staff provide technical assistance, review and advice, training, and support. Consult the *Pavement Design Guide* when preparing pavement designs for new construction or full-depth reconstruction projects.

Kentucky uses AASHTO's mechanistic empirical (ME) pavement design process and AASHTOWare's Pavement ME software. For most new and reconstructed pavements in Kentucky, designers use Pavement ME. A 20-year design life is recommended if Pavement ME is used to develop the structural design. Pavement Branch staff assist the PDT in tailoring solutions to project-specific conditions.

Optimal pavement designs adapted to the conditions and characteristics of each project location depend on engineering factors, including:

- **Traffic**
 - Consider both total volume and the percentage of truck traffic when selecting pavement type.
- **Subgrade Characteristics**
 - The load-carrying capacity of a native soil is of utmost importance in pavement performance. The Geotechnical Branch offers guidance and makes recommendations with respect to subgrade stabilization.
- **Construction**
 - Speed of construction, maintenance of traffic stages, anticipated future widening, and ease of replacement may influence the selection of pavement type.
- **Cost**

- Initial construction costs, the cost of subsequent stages or corrective work, anticipated life, maintenance costs, and costs to road users during periods of reconstruction or maintenance are all important considerations.

The PDT initially selects hot mix asphalt (HMA) bound material or Portland Cement Concrete (PCC) pavement (flexible or rigid). Alternate Pavement Type Bidding (AD/AB) procedures may generate project savings if one pavement type does not hold a clear advantage over another.

Red Flag: A Special Note is used in plan documents to record the use of nonstandard and new materials, equipment, or testing prescribed for a project. Many examples of Special Notes are available on the Pavement Branch's web pages on the Division of Design website. These include Special Notes for Non-Tracking Tack Coat, Inlaid Pavement Markers, or Asphalt Pavement Ride Quality (Rideability.)

Red Flag: To avoid delay in finalizing a pavement design, traffic data (from the Division of Traffic) and soil characteristics and the California Bearing Ratio (CBR) (from Geotechnical staff) should be requested as early as possible in project development.

Red Flag: An excessive number of pavement mix designs can increase construction bid pricing and unnecessarily complicate general bookkeeping. The PDT should review mix requirements and consolidate them as much as possible, using input from Pavement Branch and Materials staff.

ROADWAY DESIGN

Final roadway design addresses a collection of project-specific topics. The outcome of final roadway design is a set of plans, profile sheets, cross sections, and the necessary detail sheets. During final design — if not earlier — roadway design staff engage in and complete work on numerous topics. Examples of topics on which work is completed include the following:

- Intersections,
- Roadside safety and guardrail design,
- Item quantity takeoff measurements for the general summary, pavement summary, and drainage summary (bid item quantities and types),
- Final earthwork volume measurements according to each material classification,
- Construction estimate,
- Erosion control plan details,
- Construction notes and temporary traffic control measures,
- Traffic Management Plan (TMP), including the PIP,
- Signing and pavement markings/stripping plan,
- Pedestrian and/or bicycle facilities design,
- Proposed ROW and easements,
- Deed descriptions for proposed ROW,
- Finalization of plan deliverables (including electronic files).

Red Flag: A Value Engineering Review may be required. Other specialty reviews are available (e.g., a Constructability Review). Refer to *Highway Design Guidance Manual* (HD-203.7.4, HD-204.23) for details.

Red Flag: Building the roadway and supporting structures is the primary goal of most highway projects. As such, the road designer's plans are often the focal point of the project's construction documents. The PM and road designer must communicate with the other PDT members to convey intent of the design (especially as new details are derived). The converse is also true: as the SMEs team members make

decisions and discover new details about the project, they need to convey this information back to the PM and the road designer, especially if it affects the road design and/or needs to be included in the plans.

STRUCTURE DESIGN

For projects designed by Department of Highways staff, the PM furnishes the Division of Structural Design with all necessary data for analysis and design (including the Advance Situation Survey and Advance Drainage Folder). When a consultant prepares designs for bridges, box culverts, tunnel liners, retaining walls, and noise barriers, they are submitted to the Division of Structural Design for review and approval. The review process has five phases:

- 1) Advance Situation Survey
- 2) Preliminary Plans, Stage 1
- 3) Preliminary Plans, Stage 2 (if required)
- 4) Final Plans, Stage 1
- 5) Final Plans, Stage 2

Detailed format and content requirements for the submittal are described in the *Structure Design Guidance Manual*, *Drainage Guidance Manual*, and *Highway Design Guidance Manual*.

The purpose of a PM's review of early-stage and final-structure plans is to ensure a structure's design aligns with the project's intent and does not conflict with other project details (e.g., utilities, MOT, environmental concerns)

The Geotechnical Report should be completed prior to the Advance Folder submittal, otherwise the final structure design will be delayed due to the time needed to finish the geotechnical work.

For bridges with wall-type abutments, a spill-through-type structure is generally more economical than a short-span structure with tall abutments. The selection of bridge type should be coordinated by the PM in concert with Division of Structural Design.

In many cases, the demolition and disposal of existing structures is addressed within the Standard Specifications. But in other cases, special demolition instructions may be needed, such as when the partial demolition of an existing structure carrying traffic is necessary.

Project details that complicate structure design (and the other phases project development) include:

- Curved bridges
- Phased construction
- Steel bridges
- Railroad overpass or underpasses

Red Flag: Bridges located on curved alignments (horizontally and vertically) cost more to design and construct than bridges on straight alignments. If a structure cannot be located outside a curved roadway segment, the next best option is to keep the bridge outside of pavement transitions. When it seems that a bridge alignment may need to be on a curved alignment, the PM and road designer should coordinate early with the bridge designer to ascertain structure options and decide what the preferred bridge structure would be.

Red Flag: If permits or approvals from other agencies are required (e.g., USCG, FHWA), or the structure is complex, the amount of time that should be allocated for project development is significantly longer.

ENGINEERING AGREEMENTS (UTILITIES) (IF REQUIRED)

Engineering service agreements are keep-cost agreements that KYTC uses to reimburse utility company staff or an approved consultant for relocation engineering and administrative work. These agreements may be established for engineering, accounting, legal, appraising, or consulting services. They can be used for any of the following reasons:

- The utility company requires the immediate ability to invoice only the engineering work.
- Utility relocation will be included in the highway contract, and the utility company will not be directly reimbursed for construction costs.
- The Cabinet has determined that utility relocation engineering should begin before U-phase funding is available.

As noted in the entry, **IDENTIFY AND CONTACT INVOLVED UTILITY COMPANIES, LOCATE UTILITIES**, the preliminary utility engineering design relocation may be initiated before U phase funding authorization. Initiation may occur as early as the start of roadway design. If the work is eligible for reimbursement, D phase funds are used.

Early initiation is encouraged on the following project types:

- Extensive utility work is needed and cannot be completed without early utility engineering.
- Adhering to the project schedule is not possible without early utility engineering, and the letting date must be maintained.
- The project includes complex utility relocations that require more extensive and time-consuming coordination efforts (e.g., impacts to gas transmission lines).
- Utility easements must be procured, and preliminary engineering is required to identify the easement.

When engineering agreements are used, preliminary engineering (relocation design for the utility) is reimbursed by a separate agreement using a funding source that differs from what is used for utility relocation construction. Relocation construction may be reimbursed under a typical keep-cost or lump-sum relocation agreement.

Red Flag: Only engineering-related work can use D phase funding. Absolutely no construction may be paid for with D phase funding.

Red Flag: KYTC approval and authorization of engineering services (whether utility company personnel or their consultant) is applicable only to utility companies authorized to receive compensation for relocation work.

FINAL SURVEY

The Final Survey Report records project details and is submitted to the PDM. This report generally includes the following information:

- Project name and identification, including:
 - County, Route, Mile Post, E.A., or Project Identification
- Survey date, limits, and purpose
- A scaled map (e.g., KML file) of the project area that shows all primary and supplemental (horizontal and vertical) control monumentation established along with appropriate designation
- Dated signature and seal of the Kentucky Professional Land Surveyor in charge

- Closures of all traverses
- Document all pertinent information of all control on Control Monument Data Sheets

Refer to the *Highway Design Guidance Manual* for more information.

Survey pickup will be necessary at multiple times throughout final design as the designers encounter details that are new or require confirmation. (The PM is encouraged to collect survey needs and strategically order the survey as efficiently as possible). Examples of this type of small-scale survey work include the identification of a new building or feature, a disputed property boundary between two parcels, a developing slide, or septic lines. Having accurate knowledge of where existing structures are located and their boundaries is particularly important to the design process.

Red Flag: Unless the project scope explicitly states otherwise, a survey report will not be accepted from a non-KYTC source unless it is signed, dated, and stamped by a Kentucky Professional Land Surveyor certifying the accuracy of the submitted report and verifying the accuracy of all control monuments established for the Department of Highways.

Red Flag: If a project is temporarily shelved or otherwise delayed, surveys of existing topography and property lines may become outdated and inaccurate. If so, additional time and resources will be needed to update the existing digital terrain model (DTM).

Red Flag: Additional survey pickup may be needed during ROW acquisition, because property owners often provide new or more accurate information than was previously available.

GEOTECHNICAL INVESTIGATION

Through consultation with the Geotechnical Branch, the PDM determines the level of geotechnical investigation required for the project. This level of effort ranges from advisory to a full-scale geotechnical analysis, with fieldwork, lab work, and reports for roadway, structures, or both. Traditionally, the investigation begins after the Preliminary Line and Grade meeting has been held and the alignment selection has been made. However, geotechnical information sought and received earlier in the project development process is invaluable for the PDT's decision making. For example, with early geotechnical recommendations for cut and fill slopes, much more accurate estimates of the disturbed area and the amount of ROW needed can be produced.

The *Highway Design Guidance Manual*, *Drainage Guidance Manual*, *Geotechnical Guidance Manual*, and *Structures Manual* all contain information on the level of geotechnical investigation appropriate for a given project feature. Increased geotechnical investigation is needed where springs, landslides, mines, karst, faulted strata, acidic shale, mineral deposits, or other topographic or subsurface features are present.

More extensive geotechnical field data collection and analysis are required for large drainage structures than for smaller structures. A large drainage structure is one that meets one or more of the following criteria:

- All bridges
- Culvert pipes with a diameter (or equivalent) greater than or equal to 54".
- Culvert pipes with improved inlets
- All cast in place box culverts
- All precast or metal box culverts 4' span x 4' rise or larger
- All bottomless (3-sided) structures

Final plan development relies heavily on geotechnical report recommendations. The Geotechnical Branch provides the following sheets for inclusion in the roadway plan set: geotechnical notes sheets, geotechnical symbols sheets, and soil profile sheets. Soil profile sheets are developed at a scale appropriate for the project. The soil profile can be used to establish cut and fill slopes. CBR values can be used to develop the pavement design, cut and embankment stability sections, and rock refill. The designer determines the quantities of rock available from roadway excavation and the quantity needed for rock roadbed, embankment, and rip rap using information from the geotechnical report. Embankment foundations and/or transverse (profile) benches, granular embankment, or a proving period may be needed.

Side Note: The scope of geotechnical investigations is often minimized on projects selected for expedited delivery to reduce costs and maintain the desired schedule. When evaluating how much risk will be assumed by omitting or limiting the scope of geotechnical investigations, the PM should work with a geotechnical SME to prepare a geotechnical action plan with acceptable risk levels.

Red Flag: When performing early geotechnical field investigations, analyze the environmental setting to verify that no sensitive features (e.g., archaeology, forested habitat, special use stream or wetland) will be adversely impacted by geotechnical work (e.g., drilling). The PM must decide if an environmental overview should be conducted prior to geotechnical field investigations.

Red Flag: The Geotechnical Branch's online database houses the results of completed KYTC geotechnical investigations. Additional geotechnical mapping and information may also be obtained from the Geotechnical Branch. The Geotechnical Branch's online database is located at: <http://kgs.uky.edu/kgsmmap/kytcLinks.asp>

Red Flag: To retain flexibility in project work tasks and keep a project moving forward, a PM may want to consider initiating geotechnical fieldwork for the roadway investigation separately from the geotechnical fieldwork for the structures investigation.

Red Flag: Karst terrain (including sinkholes, closed drainage basins, sinking streams, caves, and similar geohydrological features) requires additional investigation and analysis during design. Stringent guidelines for drainage design and construction are in place and must be adhered to if sinkholes will be used for drainage.

Red Flag: Potentially adverse pH conditions in the surrounding soils and geology should be evaluated. Elevated acidity can result from strip mining or other actions that expose acid-producing soils, acid shale seams, or other acid-producing formations. Additional requirements during design and construction should be expected where these conditions are present.

Red Flag: A common source of plan error is omitting recommended quantities from the geotechnical report. For example, it may be helpful for the report to list where rock and fabric are recommended to deal with the presence of saturated soil. Omitting these quantities from the plan quantities can result in overruns or change orders.

TRAFFIC CONTROL DEVICES

Traffic control devices regulate, inform, warn, or guide drivers. Examples of traffic control devices include signing, pavement markings, electrical traffic control devices (including traffic signals), and lighting. The PM is responsible for identifying and including appropriate traffic device plans in the total plan set.

Once the PM identifies project locations that may require signal, signing, and/or lighting plans, they notify the District Traffic Engineer and Central Office Traffic Operations. (To facilitate this process, the PM should notify the District Traffic Engineer of project meetings and inspections as early in the process as

feasible.) The District Traffic Engineer will send a written request and provide appropriate supporting information to Central Office Traffic Operations.

The Division of Traffic Operations provides oversight when a consultant is hired to design signing, signals, or lighting devices. Oversight takes place during plan development and through a review of final plan details. Alternatively, Traffic Operations may design devices in-house and coordinate project details with the PM. Road projects generally include the design and installation of one or more of the following devices:

- **SIGNS:** Plans are prepared for new sign installations for interstates, parkways, and other high-volume, limited-access roads that include interchanges. See the *Traffic Operations Guidance Manual (TO-400)* and *Highway Design Guidance Manual (HD-1201.2)*.
- **PAVEMENT MARKINGS & DELINEATION:** Like signs, pavement marking plans are prepared for interstates, parkways, and other high-volume, limited-access roads that include interchanges. See the *Traffic Operations Guidance Manual (TO-500)* and MUTCD.
- **ELECTRICAL TRAFFIC CONTROL DEVICES:** The PDT may choose to modify existing electrical devices or install new electrical devices on a project (e.g., traffic signals, advance warning flashers, railroad-warning system, flashing beacons, school flashers). When this occurs, District Traffic Operations forwards the recommendation to Central Office Division of Traffic Operations (on the PM's behalf). It contains roadway plan details, traffic counts, traffic projections, and crash history. See the *Highway Design Guidance Manual (HD-902)* and *Traffic Operations Guidance Manual (TO-600)* for more information.
- **LIGHTING (e.g., conventional light poles, high-mast lighting):** The process for requesting lighting designs and plans is described in the *Highway Design Guidance Manual (HD-902.7)* and *Traffic Operations Guidance Manual (TO-701 through TO-716)*.
- **MISCELLANEOUS:** The PM should confer with the Division of Traffic Operations when making decisions about rumble strips, runaway truck ramps, and work zone traffic control (see **TO-801 through TO-803**).

In 2012, the Division of Highway Design (No. 03-12) and Division of Traffic Operations (No. 01-12) issued a joint memo that explains procedures for developing plans for electrical devices as part of a roadway design project. Plans must be developed in accordance with:

- Kentucky Transportation Cabinet (KYTC) CAD Standards,
- *Kentucky Standard Specifications for Road and Bridge Construction*,
- *Traffic Operations Guidance Manual*,
- *Highway Design Guidance Manual*,
- Division of Traffic Operations' Roadway Lighting Standard Detail Sheets,
- *National Electrical Code*,
- *National Electrical Safety Code*,
- MUTCD, and
- AASHTO's *Roadway Lighting Design Guide*.

Red Flag: To avoid conflicts (e.g., expensive utility impacts, time-consuming ROW purchases), the PM must coordinate the design of signs, signals, and lighting devices with all other design processes. Under no circumstances should this be postponed until the project letting nears.

Red Flag: All sign supports located in the clear zone must have a breakaway design or be protected by crashworthy barriers. When struck by a vehicle, a breakaway sign support either separates from the base or yields, allowing the vehicle to run over it. When possible, coordinate sign placement with the barrier systems that will be used on the project. The PM coordinates with the Division of Structural Design on the structural design of sign supports.

RIGHT OF WAY LAYOUT & REVISIONS

The PDT considers numerous factors when establishing limits for the proposed ROW. The extent of ROW must be sufficient to accommodate the construction and maintenance of the new roadway and structures. Access control type(s) affects new ROW limits as well as the location of entrances or approach tie-ins. Deed research undertaken as part of survey work clarifies the existing ROW and property boundaries and is used to identify prior easements or rights (e.g., mineral rights or access) that must be addressed during ROW acquisition. It may be appropriate to acquire permanent fee-simple ROW, permanent easements, temporary easements, or some combination of these.

Whenever ROW plans are modified, a *Right-of-Way Revision Sheet* is added to the ROW plans. It is inserted directly after the layout sheet and numbered *R1a*; see the *Highway Design Guidance Manual (HD-208.6)*. Each time a revision is processed, the *Right-of-Way Revision Sheet* should be updated electronically, reprinted, and inserted into the plans. For some projects, the Director of Division of Right of Way and Utilities may adopt an informal version of this revision process. Regardless of the method used, it is important to meticulously track all changes. The District Right of Way Supervisor keeps the Director of the Division of Right of Way and Utilities apprised of the status of the project plans and deeds.

Red Flag: For parcels that proceed to condemnation, the PM must identify and then preserve the plan version used at the time the suit was filed even if ROW revisions occur adjacent to the parcel being litigated. Legal staff also require exhibits or prints; those files must be similarly preserved.

Red Flag: Adequate temporary easement must be provided around improvements if they will be demolished after ROW acquisition. Examples include pond dams and buildings.

Red Flag: Adequate ROW must be provided to maintain traffic and perform construction activities even if doing so produces a larger footprint than what is needed for the final roadway.

FINAL PLAN DEVELOPMENT

Contract plan sets are the highway plans awarded through the letting process. They are a product of the project development process and consist of the roadway, structures, traffic, and/or utility relocation plans. When contract roadway plans and proposals are submitted to the Division of Highway Design's Plan Processing Branch, all electronic file submittals must adhere to the standards outlined in the *CADD Standards for Highway Plans*. These standards have been established to ensure files are put to the best possible use during the review, publication, construction, and archival processes. The standards represent the minimum requirements for the development of highway plans and are available online at:

<http://transportation.ky.gov/CADD-Standards/Pages/default.aspx>

Red Flag: Performing a final comparison of the structure and roadway plans during final plan development is worthwhile, especially for reconstruction projects. For example, if a new structure's beam arrangement conflicts with MOT plans for using the existing structure, the project will take longer, the contractor may file a claim and a change order could become necessary. Finding and addressing such issues during design saves time and expense later.

ROADWAY (& STRUCTURES) PLANS, SPECS, & ESTIMATES TO PROJECT MANAGER/PLAN PROCESSING & REVIEW

The PM submits the following materials to the Plan Processing Branch approximately five months before the scheduled letting date:

- Check prints (first submittal of final plans),
- Cost estimate, and
- Estimated completion date.

The Plan Processing Branch returns the plans to the PM with corrections and comments. The PM makes any necessary revisions to the plan set so that all appropriate items are included. Detailed formatting requirements for the components of a complete set of plans can be found in the *Highway Design Guidance Manual* (HD-200).

Final plans must be submitted to the Plan Processing Branch either 60 or 90 days prior to letting. Deadlines are dependent upon the project type. A Final Plan Submittal Form is required for all projects (*Highway Design Guidance Manual*, **HD Exhibit 200-22**). The Project Development Checklist is a federal requirement. Guidance and submittal requirements are available in the *Highway Design Guidance Manual* (HD-209).

Red Flag: If the final construction bid documents will contain utility relocation plans, they are incorporated into the final plan set once they are received from the utility designer. More information is available within the *Utilities Guidance Manual* (UR-1200).

Red Flag: When a railroad is involved, special notes or provisions that were made a part of the binding agreement between KYTC and the railroad company are included in the project proposal for the bid letting. Typically, the Division of Construction Procurement's Plans, Specifications, and Estimates Branch requests from the Rail Coordinator the *Special Notes for Protection of Railroad Interest* and Form TC 69-11 (*Summary for KYTC Projects That Involve a Railroad*). The RC reviews the final plans to ensure that the railroad company's comments and requirements have become a part of the formal plans.

FINAL JOINT INSPECTION

During the Final Joint Inspection meeting the PDT and project-specific SMEs (e.g., environmental, ROW, utilities) review the project design and the proposed contract plans and documents. Construction, maintenance, traffic, structures, and drainage staff may be invited to attend and offer input. The proposed plans are distributed in either electronic or paper (i.e., hard copy) format to attendees prior to the meeting so they can perform a detailed technical review of the project's design and prepare feedback. This technical review provides reasonable assurance that the project design is complete, accurate, and of high quality.

Another goal of the review is to confirm that the roadway design information found in contract documents will effectively communicate the engineering details, facilitate construction contracting, and help to achieve project construction that is consistent with KYTC requirements and specifications.

All projects should have a Final Joint Inspection meeting. One is held when the contract plans are approximately 80 percent complete. The plans reflect approved decisions from the DES, as well as all ROW and utility information, including identified relocations, detailed MOT information, and traffic plans. Other design review meetings can be combined with the final inspection (such as a structure review for bridge replacement projects or the drainage inspection). The PM makes the contract plans available to the PDM and the Location Engineer. The Final Joint Inspection Meeting is scheduled to ensure that the PDT has at least two weeks to review the plans. When appropriate, contract plans are made available to the FHWA and city or county. A construction cost estimate detailing biddable quantities is included.

Side Note: As representatives from multiple specialty groups attend the Final Joint Inspection, the meeting can have a large number of attendees. As such, its success hinges on good planning and focused discussions. The PM can take the following steps to ensure a successful Final Joint Inspection meeting:

- Create and distribute a systematic agenda
- Focus attendees by using a single display for the entire room
- Designate one meeting facilitator who is responsible for keeping discussions moving
- Group agenda topics according to the specialties represented (i.e., team members may wish to attend only the discussions relevant to their expertise.)

Side Note: The DEC (and environmental SMEs) may review plans at the Final Joint Inspection to verify environmental commitments are accurately documented. During the meeting, the PM should remind the PDT of commitments made in the NEPA document. For example, impacts to historic properties should be reviewed and taken into account as ROW plans are generated (a task regularly completed after the Final Joint Inspection). Follow through after the Final Joint Inspection can prevent the erroneous purchase/demolition of an eligible structure. Refer to Design Memo 01-18 for additional guidance.

Red Flag: Under no circumstances should the Final Joint Inspection meeting be scheduled before the following have been completed: the geotechnical investigation, structure design, pavement design, drainage design, and roadway design.

Red Flag: Final Joint Inspection meeting attendees should be granted at least two weeks to examine review materials. Schedule the distribution of review materials accordingly.

RIGHT OF WAY PLANS

ROW plans should be approximately 80 percent complete prior to the final joint inspection. At this point they should include all ROW and utility information (including relocations). Proposed ROW or easements must be adequate to support features and activities such as side slopes, drainage structures, signs, utilities, waste sites, staging areas, and maintenance of traffic. ROW plans are compiled after the Final Joint Inspection meeting(s). The PM submits ROW plans to the Director of the Division of Right of Way and Utilities via the District Right of Way Supervisor. See the *Highway Design Guidance Manual (HD-1302)* for detailed instructions on developing ROW plans and related processes.

Include the project location, description, and identification features on a layout sheet (the title or cover sheet for the ROW plan set). The location map must be constructed so users can easily locate the project. The layout sheet is signed by the PM and State Highway Engineer. For projects on the NHS, the layout sheet must note what type of access control has been proposed. See the *Highway Design Guidance Manual (HD-1100)* for information on different types of access control. The following items are included with the ROW plan submittal: deed descriptions and source deeds of the property being acquired, ROW plans, item number, description, program number, county, and route.

When KYTC retains a ROW consultant, the district office includes a full set of ROW plans in advertisements for consultant services. Once a ROW consultant is selected, the District Office supplies to them a set of plans for parcels included in the contract.

Red Flag: Excess property is *not* identified when ROW plans are submitted. ROW plans are revised to reflect excess parcels only after the district Right of Way Supervisor determines that an excess parcel has been identified and will be acquired. Descriptions of excess property are provided upon request. Procedures for handling excess property are detailed in the *Right of Way Guidance Manual (ROW-805-4)*.

RIGHT OF WAY FUNDING AUTHORIZATION

ROW funding authorization requests include the following:

- Plans,
- ROW cost estimates,
- Project agreement (prepared by the Division of Program Management and required by 23 CFR Part 630, Subpart A.), and
- Timeframes for completing ROW work.

The Division of Program Management submits to the Division of Right of Way and Utilities a completed Form TC 10-1 (*Project Authorization*) signed by the KYTC Secretary. Form TC 10-1 authorizes funding and describes the project's limits, conditions, and related responsibilities. For Federal-aid projects, an FHWA letter of authorization (PR-1) is also required. Funding may be applied to all activities or dedicated to preliminary work.

Side Note: If project changes arise (e.g., additional funding needs), supplementary TC-10 forms are used to address them.

RIGHT OF WAY OFFICIAL ORDER, NOTICE TO PROCEED, NOTICE OF ACQUISITION

Once the Director of the Division of Right of Way and Utilities receives 1) a TC 10-1 form, 2) PR-1 form (if applicable), and 3) approved ROW plans, they request an Official Order. An Official Order authorizes ROW acquisition using eminent domain procedures permissible under Kentucky law.

After the Official Order is signed by the Office of Legal Services, the State Highway Engineer, and KYTC Secretary, the Division of Accounts numbers and returns the Official Order to the Division of Right of Way and Utilities.

Once the Division of Right of Way and Utilities receives project funding, the Acquisition Branch creates a project file that contains individual files for each parcel. Parcel files include hard copies or electronic copies of all relevant documents, including official orders.

Red Flag: Funding authorization for ROW does not constitute authorization to initiate all ROW work activities (as in the case of funding authorization for Planning or Design phase activities).

RIGHT OF WAY SCOPING MEETING

If KYTC plans to retain a consultant for ROW acquisition, District Office staff prepare a request for consultant services and forward it to the Central Office Acquisition Branch. Once a prequalified consultant is approved, the consultant coordinates with the Division of Right of Way and Utilities to develop a project report and set up a scoping meeting.

At a scoping meeting, District staff describe how the project is to progress and set recommended time frames for completing each task. The following consultant personnel should attend the scoping meeting:

- ROW Project Manager,
- Appraiser,
- Review Appraiser, and
- All Negotiators and Relocation Agents.

Attendees from the KYTC District Office should include:

- ROW Supervisor,
- Property Management Agent,
- Relocation Agent,
- Utility Agent,
- Project Development PM,
- PDM,
- DEC, and
- Design Consultant (if needed.)

For a more detailed list of scoping meeting requirements, see *Scoping Meeting Guidelines* on the KYTC Division of Right of Way and Utilities website.

GRAVE RELOCATION (IF REQUIRED)

Despite efforts to avoid cemeteries, KYTC projects may sometimes impact graves or cemeteries. If project impacts to a cemetery require the relocation of one or more graves, the PM coordinates with staff in the Divisions of Right of Way and Utilities and Environmental Analysis to complete the process. These staff work together to ensure KYTC complies with all applicable laws, including the Native American Graves Protection and Repatriation Act (NAGPRA) and the National Historic Preservation Act (NHPA). The PM may also need to contract for the use of Ground Penetrating Radar (GPR) to identify unmarked graves.

The Division of Environmental Analysis assesses all affected cemeteries for historical significance (Section 4(f) determination) and the presence of Native American graves. The District Right of Way Supervisor sends to the DEC the following information along with a request for assessment:

- Number of cemeteries within the ROW limits
- Location of each cemetery impacted by the project
- Number of graves affected in each cemetery
- Descriptions of each cemetery and the impacts they will incur from the project
- Plat of each disinterment cemetery
 - Disinterment cemeteries are those impacted by the project and from which human remains will be disinterred
- The property owner, the cemetery owner, and their relationships to those interred

Cemeteries that contain interments that are at least 50 years old must be assessed for historic potential. Division of Environmental Analysis staff or prequalified consultants complete the National Register of Historic Places (NRHP) assessment of cemeteries, usually during the Phase I archaeological intensive survey. Relocating a cemetery that is potentially eligible for the NRHP must be completed through archaeological excavation. In accordance with the *Right of Way Guidance Manual*, the Division of Environmental Analysis SME works with the District Right of Way Relocation Agent to notify next of kin. Archaeological excavation of the cemetery must occur only after the Division of Environmental Analysis SME obtains a permit from the Office of Vital Statistics (Cabinet of Health and Family Services, Department for Public Health).

If the historical assessment demonstrates a cemetery is not eligible for the NRHP, the Division of Environmental Analysis issues a clearance memorandum to proceed with its relocation. The Division may contract with an archaeologist to relocate remains. Staff also have the option of authorizing the Division of Right of Way and Utilities to relocate remains. When Division of Right of Way and Utilities personnel are authorized to relocate remains (and either right of entry has been granted or the parcel has been acquired),

an experienced Relocation Agent is assigned to coordinate the effort with a funeral director licensed by the Commonwealth of Kentucky.

The Relocation Agent must thoroughly understand all relevant policies and procedures. They are to ensure contractors comply with state, county, and local health laws (e.g., obtaining the permit from the Office of Vital Statistics) as well as the contract's terms and conditions. The Relocation Agent also develops cost estimates for relocating graves. When physically possible, the District relocates remains to empty plots within the disinterment cemetery. If the remainder of the disinterment cemetery is landlocked or too small, remains are relocated to the closest perpetually maintained public cemetery (i.e., a re-interment cemetery) unless the next of kin prefers another location. Every reasonable request of the next of kin is honored.

Red Flag: Once unknown remains or remains whose next of kin cannot be relocated are found, the Grave Relocation Agent places a public notice in all local newspapers that advertises KYTC's intent to relocate graves. The notice is published once a week for 60 days. If next of kin do not come forward during that period, the Grave Relocation Agent submits an affidavit and resolution to the county fiscal court requesting authorization to relocate the graves. **Note:** Obtaining this authorization does not constitute right of entry.

Red Flag: If a cemetery is identified after acceptance of the Phase I archaeological intensive survey, an assessment of the cemetery must be completed as a late discovery. Late discovery occurs when previously unidentified historic properties or unanticipated effects are identified following KYTC's completion of the Section 106 review. Late discovery of evidence of human remains requires the immediate stoppage of all project work in the vicinity of the discovery area. Project work cannot move forward until an assessment of the remains is completed.

COMPLETE APPRAISALS

If staff appraisers are available, the District Right of Way Supervisor assigns one or more to appraise project parcels. Appraisal standards throughout the state are uniform, and all property owners are entitled to just compensation for their property, which is calculated in the following manner:

Compensation = Fair Market Value of the Entire Property Prior to Acquisition – Fair Market Value of Property Remaining Following Acquisition

Minor Acquisition Review (MAR) = Valuation must be based on a review of available data and is prepared by a Right of Way staff member knowledgeable about the local real estate market. A property does not need to be appraised if it meets one of two conditions:

- Its anticipated value is less than \$10,000, or
- It has a value of between \$10,000 and \$25,000 and the property owner grants an appraisal waiver.

UPDATE TITLES

KYTC Division of Highway Design staff or the design consultant provides a copy of the recorded source deed or deeds for each parcel and indicates title information on the plans.

Before ROW plans are formally submitted by the Division of Highway Design, the Right of Way Supervisor asks the Acquisition Branch Manager to 1) develop title reports in consultation with the district attorney, or 2) requests the Office of Legal Services assign an attorney to complete this work. Title sources are obtained by contacting property owners and/or through a search of the county court clerk's records.

Red Flag: Uneconomic remnants are properties that have little or no utility or value to the owner. While KYTC may offer to purchase an uneconomic remnant, the property owner may convey or retain the remnant. An uneconomic remnant should be acquired in fee simple and described separately in the deed of

conveyance. Negotiators never make an offer to acquire uneconomic remnant property with onsite contamination. If a condemnation action is necessary to acquire needed ROW, the uneconomic remnant must be excluded from the suit.

APPRAISAL REVIEW & CENTRAL OFFICE APPROVAL

District Right of Way and Utilities staff and the PM work jointly to ensure parcel boundaries are consistent with accepted appraisal procedures and that all property interests have been identified and considered. Review of the appraisal should be completed before starting negotiations for property acquisition. The review must closely attend to accuracy, documentation, and final value conclusions. Final approval for all appraisals is given by the Appraisal Branch Manager, the only person that determines Just Compensation for the KYTC.

SCHEDULE PROPERTY OWNER MEETINGS

Once acquisition has been authorized, the negotiator schedules a one-on-one meeting with the property owner. After this meeting has concluded, the negotiator documents the meeting's date, time, place, and all attendees. They also prepare a formal record of all salient items discussed, property owner improvements, questions asked, and answers given. If the negotiator is unable to answer a question during the meeting, they should include the answer in the record of a subsequent meeting.

Property owner information meetings may be held on medium- and large-scale projects. They afford property owners the opportunity to learn about how ROW acquisition will impact their property (rather than finding out at the initial offer to purchase meeting). These meetings, combined with addressing unexpected issues at an earlier date, save time during negotiations. Inviting staff from the Division of Right of Way and Utilities and the Division of Highway Design to the meeting makes them available to answer specific questions about the acquisition. To facilitate explanations of the proposed acquisition to a property owner Right of Way staff should furnish them with a copy of the ROW plans and review their contents.

Negotiators prioritize parcels: 1) where relocation assistance is needed, 2) that involve minor heirs and title problems, 3) that face inevitable condemnation, 4) have out-of-state resident property owners, or 5) have outstanding environmental issues (e.g., deferred archaeology.). All of these issues may draw out the acquisition process. When relocation assistance is needed, negotiator's coordinate with the Relocation Agent as soon as possible so the displaced person is located expediently.

ACQUISITION STAGE RELOCATION REPORT (ASRR)

When a Relocation Agent observes personal property in the acquisition area, they designate it as a relocation parcel. Following the authorization of acquisition, but prior to the start of ROW activities, District relocation staff or the contractor submits an ASSR, including estimates for the time needed for the orderly relocation of residents and businesses.

The District Right of Way Supervisor submits the ASRR to the Relocation Branch Manager. The report identifies relocation impacts documented in interviews with people who will be displaced. The ASSR must contain the following information:

- The total number of residential, business, farm, nonprofit organization, sign, and miscellaneous move displacements;
- Potential relocation problems (e.g., inadequate supply of comparable replacement housing or nonresidential replacement sites; the need for last resort housing funds; displaced people who are low-income, elderly, or handicapped);
- Description of the center line, property lines, and topographical features;
- The number of owners and tenants, including property owner names and source of title;

- Parcel numbers; and
- Estimated time required to carry out a relocation program.

Until the Relocation Agent or consultant personally interviews the property owner, inspects the parcel, or confirms otherwise, KYTC presumes a displacement will occur on any parcel where an improvement is acquired.

Red Flag: Sometimes it is not apparent that acquisition will result in displacement, especially with partial acquisitions. Coordinating with the PDT, the District Relocation Agent must identify the full range actions involved in a partial acquisition that may necessitate relocation (e.g., impacting an aging septic system, but not the residence itself.)

Consider the impact on occupants of real property who may be subject to a partial acquisition. The decision to displace can be made when preparing the ASRR or when additional information becomes available.

Red Flag: When a project requires a permanent easement on a railroad's ROW, railroad sheets (including all survey information, proposed railroad deeds, and cost appraisals) and the project's ROW plans must be submitted to the Railroad Coordinator.

RIGHT OF WAY ACQUISITION

All operations and functions within the ROW program must comply with the regulations and procedures outlined in the following:

- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended;
- 23 CFR Part 710;
- Uniform Standards of Professional Appraisal Practice (KRS 56.610);
- KRS 177.021;
- 600 KAR 3:010; and,
- KYTC *Right of Way Guidance Manual*.

Subagents and local public agencies (LPAs) must also comply with these regulations and procedures when acquiring ROW.

As early as possible — but not before the Notice to Proceed is received from Central Office — the District Right of Way Supervisor prepares the Notice of Proposed Acquisition Letter that will be sent each owner of real property that the Cabinet wants to acquire. The letter advises owners of the legal protections they are entitled to, pursuant to 49 CFR.

Red Flag: Under special circumstances and following guidance provided by Central Office Right of Way staff, an advanced protective buying acquisition may be used to either:

- Achieve cost savings by preventing excess ROW acquisition expenses due to either imminent development or future increased costs on a preferred project location.
- Facilitate hardship acquisition (due to health, safety, or financial reasons). A property owner must provide a written submission that supports their claims of health, safety, or financial reasons creating an undue hardship (e.g., an inability to sell the property at its fair market value within a reasonable period of time).

IMPLEMENT RELOCATION ASSISTANCE (IF REQUIRED)

District Right of Way Supervisors are responsible for the Relocation Assistance Program in their district. Central Office Right of Way Relocation Specialists assist them. A District Relocation Assistance Agent has comprehensive knowledge of the parcel owner, displaced person, relocation type (residential, business, farm, nonprofit, billboard, or miscellaneous), and the impact of acquisition on the displaced person. In all cases, the Relocation Assistance Agent attempts to personally contact all displaced people before coordinating with the buyer agent to present simultaneous fair market value (FMV) and relocation offers. A relocation offer or notice to a tenant is made within 7 days of the FMV offer.

KYTC pays for estimates prepared by movers, sign companies, health departments (for site evaluations), fencing, and other items acquired or personal property that needs to be moved.

When acquisition is going to displace a tenant, the Relocation Agent contacts both the property owner and the tenant to verify terms of the rental agreement or lease and explain the benefits and services available to each party.

OFFER ACCEPTED

Once the Cabinet's offer has been accepted and KYTC receives the signed conveyance agreement from the property owner, the negotiator submits the payment request to the Central Office.

PROCESS RIGHT OF WAY PAYMENT

If possible, all liens or encumbrances against acquired property rights are released prior to check delivery. Otherwise they are released at check delivery. Because most releases require a portion or all of the money, they generally are obtained at check delivery. KYTC has two options for getting a check to a property owner: 1) it can be sent by mail to the property owner, or 2) it can be delivered in person by someone other than the parcel's appraiser or negotiator. After the check has been delivered, the executed deed is taken to the county clerk's office and placed on record. The District returns the recorded deed to the Central Office for permanent filing. A copy is retained in the District's parcel file.

CONDEMNATION

If all reasonable attempts to negotiate for a property do not result in an agreement, the Cabinet will initiate a condemnation action. The Acquisition Branch Manager and their staff review the parcel(s) recommended for condemnation action. If they verify reasonable measures were taken to settle with the property owner and it is unlikely further negotiations would be productive, the Director of the Division of Right of Way and Utilities sends a written request to the Office of Legal Services recommending condemnation. Condemnation is also necessary whenever rightful ownership of the property or a partial property interest cannot be established.

The PM provides relevant plan sheets and descriptions for any parcel recommended for (or is in) condemnation as well as exhibits that may be needed during proceedings.

SEND 10-DAY LETTER

The negotiator must thoroughly explain to the property owner what steps are involved in the condemnation process. The negotiator needs to inform the property owner that they will receive the 10-day letter from the Cabinet, which affords them a chance to make another counteroffer if they so choose. At the end of this 10-day period, if the property owner has not responded or an agreement cannot be reached, KYTC sends another explaining that the condemnation action is moving forward. A Cabinet attorney should help draft the letter; the letter will explicitly state that further questions must be directed to KYTC's attorney.

SUBMIT CONDEMNATION TO CENTRAL OFFICE & LEGAL, ASSIGN ACTIONS

Parcels selected for condemnation are submitted to Acquisition Branch Manager and the District's attorney by agents conducting the negotiations. If the District lacks an attorney, the parcel is submitted to the Acquisition Branch Manager so that an attorney may be assigned.

FILE SUIT

Condemnation actions do not always proceed to trial. They may be resolved through an administrative settlement, legal settlement (with recommendation by the Commonwealth's attorney), or court-ordered mediation.

The *Right of Way Guidance Manual (ROW 703-5)* outlines the conditions under which an attorney can agree to a legal settlement. The attorney's authority varies based on how much the legal settlement deviates from a parcel's appraised value. If the deviation exceeds what the attorney is authorized to approve, the attorney provides a recommendation for settlement to the Director of Right of Way and Utilities. Only the Director has full settlement authority.

Lessees are made party to the suit unless the leasehold interest has been absolved. Uneconomic remnants (excess property) are excluded from condemnation suits.

INTERLOCUTORY ORDER JUDGEMENT (COMMISSIONERS' AWARD)

For KYTC to take possession of a condemned property, the circuit court shall have signed and entered an Interlocutory Order and Judgment (IOJ). Once an IOJ has been entered, the state posts with the circuit clerk the sum awarded to the property owner by a Commissioners' Award, a court judgment, the amount of an agreed IOJ, or the amount of an agreed order settling the case. In some cases, the Commonwealth's attorney will recommend settlement, but the Director of Right of Way and Utilities is the only one with full settlement authority. Checks issued as result of judgments taken in circuit court, jury verdicts, or settlements of condemnation actions are forwarded to the district attorney for distribution.

RIGHT OF ENTRY

For all condemnation actions the Commonwealth's trial attorney must notify the appropriate district Right of Way Supervisor of the date right of entry is received. Rights of entry can be accepted only for unoccupied parcels.

BIOLOGICAL ASSESSMENT

Biological Assessments (BA) evaluate how proposed actions will impact federally listed threatened or endangered species. They are used to determine whether KYTC requires a formal consultation or conference with the USFWS. A BA is performed once a KYTC or consultant biologist has determined that 1) one or more federally endangered to threatened species may potentially be present in the project area, and 2) suitable habitat for those species is located within the project area.

The BA examines all locations that may be affected by the project's physical, chemical, and biotic impacts as well as its direct, indirect, and cumulative effects. The PM defines which areas should be evaluated during a BA, which typically encompass an area larger than the project's physical footprint (the area within the disturb limits). In some cases, the entire proposed ROW is studied.

Prequalified environmental consultants or Division of Environmental Analysis SMEs conduct BAs. They consist of literature review and early coordination with resource agencies, field investigations, and reporting possible state and federally listed species that may be present within the action area. The BA builds on prior project work, including the Habitat Assessment and Ecological Base Study.

If a BA identifies the presence of federally threatened or endangered species in the project area, avoidance and minimization strategies are recommended to address potential impacts. One of three findings is assigned to each species or critical habitat studied:

- No effect,
- May affect, not likely to adversely affect, or
- May affect, likely to adversely affect.

FHWA considers determinations of effect valid for a period of five years from the date of field investigations. Unless the project scope changes anticipated impacts, other findings within the document remain valid.

The DEC coordinates review of the BA report with the PM. Project commitments from the final report are captured and recorded in the *Communicating All Promises* (CAP) section of the Six Year Plan database.

More detailed information on BAs can be found in the *Environmental Analysis Guidance Manual* (EA-806).

Red Flag: When a BA results in a finding of *may affect, likely to adversely affect* for any federally endangered species, the Division of Environmental Analysis must coordinate with the lead federal agency to begin a formal Section 7 consultation with the USFWS. A formal consultation culminates in a Biological Opinion (BO) prepared by the USFWS that is completed within 135 days of the formal consultation being initiated. More realistically, however, and depending on project complexity and severity of impacts, the consultation process may take from 6 to 18 months. If the USFWS issues a *no-jeopardy* BO, the project may continue as planned, under certain conditions. If the proposed action will jeopardize a species, the federal government may propose alternatives, require additional mitigation measures, *or deny the project*. The BO identifies reasonable and prudent measures that can be incorporated into the project to minimize potential harm to affected species. It also describes terms and conditions that must be followed to ensure those measures are implemented properly. A BO does not expire unless the project scope is altered or a change in species status occurs.

ENVIRONMENTAL PERMITTING

KYTC must obtain appropriate permits or certifications when the project impacts wetlands, streams, lakes, and/or rivers, regardless of state or federal funding type. The *Environmental Analysis Guidance Manual* (EA-1101) includes a complete list of applicable laws, statutes, regulations, executive orders, and policy.

Early in the project development process, the Division of Environmental Analysis SME, with the help of the PDT, must identify impacts to waters or their significant nexus. The magnitude of the project's impacts dictates what type of permit(s) is required. It is imperative that the permitting process begin as early as possible to prevent it from entering the critical path, which can result in project delays.

The USACE assumes permitting authority under the Rivers and Harbors Act. According to Section 404 of the Clean Water Act (CWA), the Environmental Protection Agency (EPA) can delegate authority over the Waters of the U.S. to the USACE, although the EPA retains veto power. The USFWS and state water quality agencies have important roles as well. Section 401 of the CWA mandates that applicants obtain certification from the state stipulating that a proposed project meets the state's water quality standards. A Section 401 Water Quality Certification (WQC) confirms that activities authorized under Section 404 of the CWA or Sections 9 and 10 of the Rivers and Harbors Act – both administered by the USACE – will not violate Kentucky's water quality standards (401 KAR 10:031).

Pursuant to Section 404 of the CWA, the USACE issues general and Individual Permits (IP). General permits are issued on a nationwide, regional, or statewide basis for specific project categories. They are reserved for activities that have minimal adverse effects. For example, Nationwide Permit 3 authorizes maintenance activities that repair, rehabilitate, or replace any previously authorized, currently serviceable structure or fill, or any currently serviceable structure or fill authorized under 33 CFR 330.3. If the project's impacts fall below notification requirements (BNR) for a specific nationwide permit, work may proceed without notifying the USACE. KYTC has an internal process for documenting BNR determinations (see **EA-1104** for Section 404 Nationwide Permits & Below Notification Requirements).

IPs are issued as a letter of permission (LOP) or standard permit for a single project that has potentially significant impacts. The LOP streamlines authorization for transportation projects that will minimally impact Waters of the U.S. They require an assessment of stream and wetland resources that may be impacted by the project (see **EA-1105** for criteria projects need to meet for an LOP). For the standard IP application package, the PM provides the DEC with detailed project plans and measurements as well as relevant U.S. Geological Survey (USGS) topographic maps, aerial photographs, and other mapping tools (at a minimum). Once issued, all IPs are generally valid for five years. If authorized construction impacts to Waters of the U.S. are not completed within the permit's authorized term, KYTC must request a permit renewal.

Red Flag: For bridge construction or modification within a navigable waterway that requires a USCG Bridge Permit, consult the *Structural Design Guidance Manual* (**SD-204**).

Red Flag: KYTC must receive prior approval from the TVA for activities that affect TVA waters.

Red Flag: If the project has multiple impacts but each impact falls BNR, the USACE is authorized to treat project impacts cumulatively, which can result in an overall impact that exceeds notification thresholds. Whether cumulative impacts result in a project that exceeds notification thresholds is solely at the discretion of the USACE. If there is potential for cumulative impacts, consult with the Division of Environmental Analysis SME to determine whether the USACE should be contacted for guidance.

Red Flag: As with any environmental clearance, altering the project scope could invalidate the existing agreement (irrespective of whether the impacts are perceived to increase or decrease). Thus, if changes in project scope will change how Waters of the U.S. will be impacted, KYTC may need to submit a new individual permit application to the USACE.

REMOVAL OF IMPROVEMENTS COORDINATE WITH DIVISION OF ENVIRONMENTAL ANALYSIS AND RIGHT OF WAY

Improvements are modifications to land that increase its value (e.g., buildings, structures, canopies, ponds, retaining walls, outdoor advertising signs, fencing). When parcels contain buildings, structures, or other improvements within the limits of road construction, they must be removed. It is preferable to demolish and remove improvements in advance of awarding the construction roadway contract. Doing so removes safety hazards, minimizes liability, and maintains an orderly ROW.

Side Note: Land and improvements are appraised separately. A parcel's total appraised value equals the sum of the land appraisal and improvements appraisal.

The Division of Right of Way and Utilities removes as many improvements as possible from the ROW limits prior to releasing parcels for project work. Before removing improvements, the Division of Environmental Analysis must identify hazardous materials located in the improvements or contaminated soil. Division of Right of Way and Utilities staff, the Division Environmental Coordinator, and the PM work in collaboration throughout this process.

REMOVE ASBESTOS

During the ROW acquisition phase, structures (buildings and highway structures) must be evaluated for asbestos-containing materials (ACM). KYTC has two processes for asbestos inspection and abatement – one for standing buildings and structure improvements within the project limits and one for highway structures like bridges.

For buildings, KYTC may perform ACM inspections at any time if it receives the permission of the property owner and the occupants. Once KYTC takes physical possession of the property, abatement proceeds. The District Property Management Agent coordinates with the Division of Environmental Analysis to evaluate improvements for ACM during the ROW acquisition phase. District property management staff address removal and abatement of ACM from structures that will be razed prior to releasing a parcel for a roadway contract. If the general roadway contractor is responsible for removing improvements, DEA handles ACM abatement before construction letting. Regardless of the party responsible for removing an improvement, the Energy and Environmental Cabinet, Division of Air Quality (DAQ), requires the contractor to submit a notification 10 working days prior to demolition. Division of Environmental Analysis inspection information supplements the contractor's formal *Notification of Asbestos Abatement/Demolition/Renovation* (Kentucky Department for Environmental Protection – DEP Form 7036) to DAQ.

When a project requires bridge demolition or removing portions of a bridge structure, including railings, barriers, substructure, or superstructure, the Division of Environmental Analysis is responsible for assessing whether asbestos is present. If Division personnel identify a potential for asbestos on the bridge, KYTC either removes the ACM prior to the construction letting or inserts asbestos removal into the roadway contract. If asbestos removal is incorporated into the contract, the roadway contractor is responsible for submitting DEP Form 7036 to the DAQ, which is supplemented by Division of Environmental Analysis inspection data.

Red Flag: Asbestos-coated waterlines may be encountered during utility relocation activities. The PM coordinates with the Division of Environmental Analysis on remediation. This can also be incorporated into the roadway contract using a Special Note that informs the contractor of the requirements for removal and proper disposal.

DEMOLITION OF IMPROVEMENTS

If the property owner does not retain an improvement and it is not needed as replacement housing for another displaced person, the district may solicit bids from contractors to remove the improvement(s). The Property Management Agent periodically inspects removal activities done by owners or contractors, keeps records of those inspections, and ensures timely removal and compliance with specifications.

PERMITS ISSUED

Once a permit is approved, the Division of Environmental Analysis notifies the: 1) PM; 2) Division of Construction Procurement's Plans, Specifications, and Estimates Branch (PS&E); and, 3) DEC. The Division of Environmental Analysis will provide copies of the permit as required.

The USACE may need to review and approve plan changes that affect the waterway or conditions of the permit after issuance. An approved IP may require another 30-day public notice. Impacts not identified on the approved plans (e.g., temporary stream crossings) may require a separate permit or permit modification before construction may begin. Excess excavation sites affecting streams or wetlands often require a LOP or IP.

It is critical that early project reviews identify permit requirements and consider these project needs. The PM should periodically revisit permitting needs once preliminary requirements have been established, and

when design details and project revisions are developed that may impact streams or wetlands. If significant changes and/or project additions are not identified during preliminary permit review it may result in the project requiring an IP or LOP permit rather than a Nationwide Permit. Securing these more complex permits requires several additional months.

ARCHAEOLOGY, FINISH

Results of Archaeological Phase I intensive surveys are used to decide if Phase II archaeology testing or Phase III archaeology data recovery is needed. Phase I and Phase II archaeology should be completed for all parcels before a FONSI document is approved (although exceptions do occur). Phase III archaeological data recovery is triggered when Phase I or Phase II testing identifies archaeological sites eligible for the NRHP *and* the site(s) cannot be avoided or preserved in place. Because property owners can find these activities very disruptive, they may require postponement until the acquisition process is complete. See the *Environmental Analysis Guidance Manual* for discussions of how the three levels of archaeological investigation differ from one another (**EA-906**, **EA-907**, and **EA-908**).

PHASE II, III HAZMAT

Regulated Hazmat, wastes, or contaminants often encountered during transportation projects include:

- Petroleum products,
- Commercial and industrial solvents,
- Heavy metals,
- PCBs,
- Pesticides, and
- Asbestos.

Potential sources of pollutants include USTs, aboveground storage tanks, waste storage areas, and commercial and industrial process locations. Action levels for individual hazardous materials are defined based on current and proposed land uses, toxicity, and risk for human exposure. For a list of applicable codes, regulations, statutes, and guidance documents, see the *Environmental Analysis Guidance Manual* (**DEA-1001**).

At sites where regulated materials have been identified or may be present, a Phase II environmental site assessment (ESA) is usually conducted after the final NEPA document is complete — but prior to ROW acquisition. A recommendation to pursue Phase II investigations is typically an outcome of a Phase I ESA, however, this decision can be made based on known site conditions, surrounding areas, or site history. The Phase II ESA identifies whether releases from USTs, aboveground storage tanks, hazardous wastes or materials, and solid and special wastes have occurred. If releases have taken place, their location and extent are delineated as well. Phase II ESA findings are used to determine whether a Phase III environmental corrective action (ECA) is necessary and estimate its cost (see **EA-1006**).

When contaminants are identified within the proposed project ROW, a Phase III ECA may be required to remediate or remove recognized environmental conditions (RECs). A Phase III ECA is done after ROW acquisition. If a contractor is removing improvements, the Division of Environmental Analysis must inspect and remove all Hazmat.

Red Flag: KYTC may require owners to perform required cleanup procedures before the agency purchases a property. The Division of Environmental Analysis and the Division of Right of Way and Utilities advise the PM and the District of the procedure to follow in such cases.

ENVIRONMENTAL CLEARANCE

To receive environmental clearance, the proposed project's environmental document must be completed and then approved by FHWA. State-funded projects do not require FHWA approval, but they may require an approval or permit from another federal agency to comply with NEPA requirements (e.g., USACE permits, USCG permits, and easements on federally owned property or federally designated lands [such as Daniel Boone National Forest]).

Sometimes an environmental document is approved but with restrictions placed on construction activities (e.g. clearing restrictions). DEA, the PM, and DEC must ensure restrictions are formally communicated to KYTC construction staff and contractors via the bid package and final contract documents. This may be done using a CAP or Special Notes in the project bid package.

The purpose of the Kentucky Pollutant Discharge Elimination System (KPDES) permit is to ensure construction activities do not violate Kentucky water quality standards (see **EA-1108**). The PM must ensure that the project's bid package contains KPDES permit information. This information is to remain in the final contract documents. An individual KPDES permit must be obtained when planned construction activities will not meet Division of Water KYR10 general permit criteria (e.g., discharge into a Special Use Water). In either case, the PM prepares plan details required for the KPDES permit process. This typically includes topographic mapping of Disturbed Drainage Areas (DDAs). These areas are to be outlined, measured, and located by coordinates. The PM should coordinate mapping with the DEC.

Red Flag: When a project delay postpones letting, the environmental clearance may expire before construction activities begin. The PM must communicate letting changes (i.e., current project status) to the DEC as they may need time to obtain reevaluations from the relevant agencies which have jurisdiction. Environmental approvals remain valid for varying time periods. The *Environmental Analysis Guidance Manual* (**EA-410**) notes how long documents associated with the NEPA process remain valid.

RIGHT OF WAY CERTIFICATION

The District Right of Way Supervisor prepares a *Right of Way Certification* (Form TC 62-226) and submits it to the PM and Director of the Division of Right of Way and Utilities for inclusion in the final plan submittal documents. This form is applicable to both state and federal projects. However, a *Right of Way Certification* must be submitted to FHWA for approval on all interstate projects and selected non-interstate projects before construction is authorized. For all other NHS projects, copies of the *Right of Way Certification* are submitted to FHWA for informational purposes only.

The *Right of Way Guidance Manual* (**RW-1302**) lists all information included with the *Right of Way Certification* form.

Revising and resubmitting of the *Right of Way Certification* is necessary if the project letting is postponed.

UTILITY FUNDS FINAL DESIGN STAGE ESTIMATE

The Utility Supervisor develops estimates for U phase funding after the PM submits a request. U phase estimates should include the costs of:

- All utility relocations,
- Utility relocation engineering,
- Inspection,
- Administration,
- KYTC utility staff coordination, and
- Railroad coordination costs when appropriate.

U phase estimates focus on the statutorily reimbursable utility relocation. The *Utility and Rails Guidance Manual* offers a full list of applicable regulations (see **UR-200**). Estimates are prepared at each project milestone, and their accuracy improves as new details become available. Estimates are assigned a class value from A to E. Class A estimates are the most detailed and accurate. Generally, the Final Design Stage Estimate is Class B or C. Refer to the *Utilities and Rails Guidance Manual* for descriptions of each estimate class (**UR-602**).

All U phase estimates and funding requests are generated, recorded, and submitted for funding through the Kentucky Utility and Rail Tracking System (KURTS). KURTS contains actively updated U phase line items for each of the Cabinet's 12 Districts.

UTILITY FUNDING AUTHORIZATION

Decisions about U phase funding authorization are made based on the Final Stage Estimate. As such, this estimate must be prepared using the best available information. KURTS houses templates and contains helpful information for preparing of funding requests.

Red Flag: U phase funding may be used to reimburse relocation work in road contracts. If executing the relocation agreement with U phase funding will delay closure of the U phase for a long period (e.g., if the roadwork will not occur for years), it may be best to use C phase funding to finance utility relocation work found in the road contract. Doing so prevents two funding phases from being tied up.

Red Flag: Any expenditures incurred by a utility owner prior to authorization of the appropriate funds will be ineligible for reimbursement.

Red Flag: U phase funding authorization may only take place after environmental clearance occurs. If utility engineering or studies are needed before utility phase funding is available, design phase funding may be used with PM approval.

JOINT UTILITY MEETING

The joint utility information meeting (JUM) is the first official meeting between potentially affected utility companies and District utility staff. All potentially affected utility companies are invited to the JUM. These companies are recorded on the project utility contact list found in KURTS. The PM and other KYTC staff attend as well. Decisions about which Cabinet staff to invite are made based on project-specific issues that require subject-matter expertise. If the potentially affected utility companies have not received the most updated versions of the highway plans, KYTC will distribute these at the meeting (electronic and/or hard copies).

The JUM provides an opportunity to:

- Validate the location of the existing facilities shown on the plans
- Identify where facilities conflict with the highway design
- Define possible relocations to address conflicts
- Examine potential resolutions with all involved utility companies to identify and resolve conflicts between their relocation plans
- Plan utility design and relocation schedules
- Identify reimbursable and non-reimbursable utility work
- Consider the highway project schedule (including anticipated letting date)
- Look for minor highway redesign measures that could minimize utility relocations
- Look for utility data needs that can be easily addressed with SUE or surveying
- Discuss appropriate erosion prevention and sediment control measures

- Discuss KYTC permitting and traffic control requirements
- Consider utility relocation work that should or can be included in the roadway construction bid package

Red Flag: For complex projects, a representative from the highway design consultant may need to attend the JUM. Likewise, the highway designer may need to attend the JUM to help avoid, minimize, or accommodate utilities in the project corridor. The design consultant may also need to sit in to provide utility engineering and coordination.

Side Note: Document the JUM through meeting minutes. Have all attendees sign a sign-in sheet. The District Utility Supervisor ensures that utility companies not able to attend the JUM receive meeting materials. Companies that do not attend are included on the project utility contact list in KURTS. A company is only removed if utility staff confirm their facilities are unaffected by the project.

MEET WITH AFFECTED UTILITY OWNER

If during the active U phase KYTC identifies additional utility facilities that will be impacted by a project, coordination with the affected utility companies begins immediately. After the Cabinet sends the project authorization letter and project plans to a utility company, KYTC staff will hold a one-on-one meeting with company representatives.

ENGINEERING AGREEMENTS AND AUTHORIZATIONS

Once U phase funds are authorized for the appropriate project phase and KYTC staff identify potentially affected utility facilities, KYTC issues project authorization letters. Authorization letters – which are also called state letters – authorize utility companies to begin facility relocation design, whether this is done by in-house staff engineers or by procuring a consultant through an engineering services contract (ESC). The Cabinet must review and approve of an ESC's terms. The *Utility and Rails Guidance Manual* provides additional information about ESCs (see **UR-900**).

Relocation agreements between KYTC and the utility company may include any reimbursable engineering work needed to execute facility relocation. In some circumstances, two agreements are established: one for facility relocation design and one for relocation construction. If utility engineering is needed before U phase funding is available, the PM can approve the use of D phase funding. When this occurs, KYTC may issue a design-only state letter authorizing the utility company to perform engineering and execute a design-only agreement with the reviewed documentation provided. An agreement for relocation construction may follow once U phase funding is available.

Red Flag: Before project authorization letters are sent, consultations with utility companies are non-reimbursable. Therefore, any consultation should be undertaken with discretion. KYTC must inform utility companies about this reimbursement limitation, and utility companies must consent to this arrangement before meeting.

Red Flag: The Cabinet has no interest in approving engineering services for non-compensable utility relocations, whether in-house or via an ESC. KYTC approval and authorization of engineering services (company personnel or consultant) is applicable only to utility companies authorized to receive compensation for their engineering and relocation costs.

UTILITY RELOCATION DESIGNS

The Cabinet's Utilities staff reviews facility relocation designs submitted by utility companies to verify the proposed relocation work is both necessary and appropriate as well as physically and fiscally viable. Whether plans are developed by in-house engineers or a utility design consultant through an ESC, a utility company's relocation design plans must specify:

- Facilities that will be removed.
- Materials slated for installation.
- Materials that will be transferred from within the project to other utility facilities.
- Items that will remain in place.
- Existing sizes, lengths, and types of underground facilities that will be abandoned.
- Pertinent specifications and standard drawings.
- Required traffic control measures.
 - **Red Flag:** All traffic control must comply with the MUTCD and the Department of Highways' Standard Drawings TSC series.
- Total project cost estimate.
 - The estimate should be itemized and separated into engineering, administrative, and construction costs.
 - Estimates *are not* required of non-compensable utility companies.
- Reasonable schedule of consecutive days for completing the relocation.
- KYTC's requested level of cost participation in the form of a percentage compensable, with justification. If facilities' functional capacity will be increased or more expensive materials are planned for use, this shall be clearly stated.
- Special requests related to project development or execution.
- For facilities in the public ROW, adherence to Accommodation Policies listed in the *KYTC Permits Manual*.

A utility company can submit relocation plans in KURTS or mail a hard copy to KYTC. However, KURTS is preferred and typically faster.

Red Flag: Compensable and non-compensable utility relocation plans have significantly different requirements. PMs should consult the *Utilities and Rails Guidance Manual (UR-1100)* and utilities staff for details.

ASSESS EASEMENT NEEDS/ACQUISITIONS

Utilities staff and the PM review easement needs proposed by the utility company in their relocation plans. ROW and easements needed to complete a relocation are acquired by KYTC or the utility company before relocation commences.

If a utility company must relocate a facility outside of its existing permanent easement or if it cannot be relocated in the new ROW, the Cabinet may obtain permanent easements on behalf of the utility. Under these circumstances, an easement agreement is executed, giving KYTC the authority to acquire a permanent easement in which the utility company may relocate its facilities. Processing of easement acquisition agreements is discussed in the *Utility and Rails Guidance Manual (UR-1104-8)*. The *Right of Way Guidance Manual* details KYTC policy and procedure for ROW acquisitions and the transfer of easements to utility companies.

Red Flag: It is imperative that KYTC and the utility company quickly identify ROW and easement needs for utility relocation. The project may benefit if an easement agreement authorizes KYTC to acquire a replacement easement on behalf of the impacted utility company, especially if the Cabinet is obtaining ROW for highway construction from the same parcel.

UTILITY RELOCATION REVIEW AND COORDINATION

KYTC Utilities staff review proposed relocation plans to ensure the proposed work is necessary and eliminates conflicts between utility facilities and highway construction. Materials proposed for use in the

relocation plans are reviewed to ensure they are consistent with the materials being replaced as well as utility company policy. For relocations in KYTC's ROW, plans are reviewed to ensure the design complies with the Cabinet's accommodation policy, which is defined in the *KYTC Permits Manual*. Any betterment of the facilities is noted and quantified.

UTILITY RELOCATION ESTIMATES (IF REQUIRED)

A Class A estimate is the most accurate type of estimate. Relocation agreements with utility companies are prepared based upon this estimate. The cost of utility relocations varies by region. KYTC relies heavily on district utilities staff to maintain utility construction cost data and to vet cost estimates.

UTILITY RELOCATION AGREEMENTS AND AUTHORIZATIONS

Two methods are available to perform reimbursable utility relocations. When an impacted utility is eligible to be reimbursed for relocating its facilities, it can formalize a written agreement with KYTC that stipulates 1) the facility relocation work will be included in the Cabinet's construction contract, or 2) the facilities which conflict with highway construction and will be removed and relocated independently of the KYTC project. Sometimes conditions prevent the completion of facility relocation until after the beginning of roadway construction, and the facility is partially relocated prior to construction, with outstanding work finished while construction is underway. The PM and Utilities staff examine project details and coordinate decisions about relocation procedures with the utility company.

KYTC Utilities staff negotiate and draft utility relocation agreements. Negotiated utility relocation agreements are reviewed by the District-level counsel in the Office of Legal Services as well as Central Office Utilities staff for quality control and to provide advice if necessary. Reviews may be completed in KURTS. Once the District-level Office of Legal Services attorney signs the fully reviewed and Cabinet-accepted original and bound agreement, the execution phase begins. Utility company representatives must then sign the agreement. An original and bound utility relocation agreement typically consists of the full legal document with the approved justification documentation attached as exhibits. All materials are bound by a blue paper backing. Once the utility company receives a fully executed contract and a notice to proceed letter (which may be held until the necessary ROW is acquired) it can begin relocating impacted facilities. Relocation activities must adhere to the reviewed and approved relocation design and terms of the contract.

Red Flag: When KYTC reimburses utility companies to relocate facilities, it must comply with the terms defined in KRS 177.035 and KRS 179.265. Facility relocation may be (1) fully reimbursable, (2) partially reimbursable, or (3) not reimbursable. Reimbursement status depends on the utility company type, the utility company's property rights, existing location of the facilities, and whether the utility company will install an improved facility. Some work may be considered betterment or otherwise ineligible for reimbursement. Betterment is defined as "any upgrading of the facility being relocated that is not attributable to the highway construction and is made solely for the benefit of and at the election of the utility." The utility agreement reflects the degree to which the Cabinet will reimburse the utility (expressed as a percentage). Companies whose facility relocation costs are eligible for compensation (pursuant to KRS 179.265) only receive compensation for facilities originally constructed on areas *other than* public ROW that must be relocated due to the reconstruction or improvement of a public road.

PREPARE FOR UTILITY CONSTRUCTION

Once the Cabinet approves the final utility relocation plans, all necessary ROW and easements have been acquired, and the agreements and accounting documents are in place, KYTC may authorize utility construction work to begin with a notice to proceed letter.

At the beginning of relocation activities KYTC staff and the utility companies relocating facilities communicate with one another about workforce mobilization and schedules. The Cabinet also distributes utility relocation schedules and applicable as-built drawings to the highway contract bidders.

UTILITY RELOCATION CONSTRUCTION

Invoices submitted electronically by the utility company or its designated representative require backup documentation. Invoicing forms are available in KURTS, and invoice packages may be submitted electronically through KURTS. For any individual project phase (e.g., planning, design, ROW, construction management), the utility company or its representative shall not submit invoices for an amount greater than the amount stipulated in the contract without notifying the utility company and KYTC utilities staff via a change order request.

Overrun quantities for work items or scope changes must be documented and approved using a change order. The utility company representative must furnish a detailed justification for change orders. KYTC Utilities staff preapprove any changes to the scope of work before work begins on revised items. When proposed construction is to be done by contract, once the District Utilities Agent receives the contract, they must review it with the low bidder plus the contracts of the next two bidders.

KYTC utilities staff must periodically inspect facility relocations. When facility relocation work is executed under the roadway construction contract, it is inspected and invoiced in a similar manner. However, KYTC construction staff may provide inspection and daily pay quantity reports to the Cabinet's Utilities staff and the utility owner.

UTILITY RELOCATION PLANS, SPECS, AND ESTIMATES TO PROJECT MANAGER

Utility relocation plans document the work required to remove utility facilities from a proposed work area and reestablish their preexisting functionality. Once relocation work is complete, the facilities must provide the same services and function as they conferred before relocation.

Utility relocation plans are required for compensable and non-compensable utility relocations. Utility companies are responsible for submitting a cost estimate only if they are expecting compensation.

Prompt submission of utility relocation plans is essential for the Cabinet to ensure that:

- All relocated facilities avoid physical conflicts with the road project,
- All relocated facilities avoid physical conflicts with other relocated facilities, and
- All facility relocations comply with the Cabinet's utility accommodation policy.

KYTC roadway plan submittals for incorporation into the bid package follow a prescribed schedule and process. Similarly, Utilities staff are responsible for submitting utility relocation plans that will be included in the letting package.

UTILITY AND RAIL CERTIFICATION NOTE

Utility and rail certification notes communicate (1) the presence, location, and relocation of utility facilities, (2) the presence and impact of railroad facilities, and (3) related structures. Every set of construction bid documents includes these notes. The notes inform contractors of facility locations and describe planned and completed facility relocations or adjustments. For planned facility relocations, the notes inventory incomplete utility construction work and its approximate completion date(s). The notes describe the presence or railroad facilities within the project area, or which are close enough to the project area to potentially impact the project. When impacts from railroad facilities are anticipated, railroad notes and documentation define the expectations of bidding contractors with respect to flagging service needs, insurance, and other considerations.

Contractors consult utility and rail certification notes for assistance when preparing bids for highway construction projects. Additionally, construction personnel use the notes to:

- Plan their project execution,
- Identify possible hazards during excavation and grading activities, and
- Plan operations involving the use of cranes, booms, or other equipment that are of sufficient height to impact aerial facilities, encroach upon critical areas, or which may otherwise require consideration during ongoing utility work.

The amount of detail in utility and rail certification notes varies according to highway project needs, the complexity of facilities being described, project complexity, and the potential impact of utility facilities and related structures on a project. A certification note template and details are available in KURTS.

Red Flag: Pursuant to 23 CFR 635.309, on Federal-aid projects the utility and rail certification note must be delivered before bidding can be authorized. KYTC also requires delivery of the utility and rail certification note prior to releasing construction funds on any project.

RAILROAD: INTERNAL KYTC REVIEW AND COORDINATION

Throughout project development, the PM and Central Office Rails staff should remain in communication about project status and rail accommodations. As long as communication is maintained between them, once U phase funds are authorized KYTC will only need to conduct minimal review of railroad impacts. The Rail Coordinator prepares a submittal package to the railroad that includes all relevant project detail.

The *Highway Design Guidance Manual (HD-1400)* contains a list of formatting requirements for railroad plan notation details, including horizontal and vertical clearance and railroad stationing. The PM may also want to reference documents specific to railroad companies, such as the CSX Construction Submission Criteria. The Rail Coordinator assists the PM while plan notation details are prepared.

RAILROAD: EXTERNAL REVIEW BETWEEN RAILROAD AND KYTC

The Central Office Rail Coordinator routinely provides information to railroad companies about planned highway construction projects that may impact their facilities. But railroad companies will not formally initiate project-specific preliminary engineering work (and incur preliminary engineering costs) until they receive a project-specific submittal package. KYTC submits this formal correspondence package to a rail company following the authorization of U phase funding (which is comparable to how state letters are submitted to utility companies). If the project will benefit from early railroad coordination, the Cabinet may use design funds for this purpose. Rail companies use the submittal package to develop cost estimates for preliminary engineering, final engineering, administration, construction management, flagging, and any other project-specific costs.

The PM should expect to go through multiple rounds of questions and revisions before a railroad company formally accepts roadway plan details. This process can affect every facet of project development, including structure design (substructure and superstructure), drainage design, and construction sequencing. Central Office railroad staff convey all railroad company comments to the PM. The PM responds to these comments by either revising plans or supplying information which clarifies the plans. The PM returns revised plans or supplemental information to the Rail Coordinator, who in turn passes them back to the railroad company. The review cycle continues until the railroad company approves the project plans.

RAILROAD ESTIMATE

The Central Office Rail Coordinator, in communication with the PM, reviews railroad company estimates for project-related railroad expenses, including those for flagging and review. If railroads need to be flagged during the construction phase, the PM will need to assess the estimated duration (and schedule) of work that will either directly impact or occur in close proximity to rail lines. The PM must include railroad flagging as a quantified bid item in the project's final construction estimate.

RAILROAD AGREEMENT

Formal agreements between KYTC and impacted railroads are similar to utility agreements. However, a railroad agreement is frequently executed as an addendum to the standing term agreement between the Cabinet and a railroad company. Termed a Rail Coordination Project Agreement Addendum, it contains project-specific details. When no term agreement has been established between KYTC and an impacted railroad, an Individual Project Agreement (IPA) is used. Irrespective of which option is used, the agreement includes plan details and cost estimates that have undergone multiple revisions and review throughout the project development process.

Red Flag: In the rare event that the Rail Coordinator and the railroad company disagree on one or more issues in the draft agreement (e.g., compensable costs, quantities, betterment, or salvage value) the Cabinet may either proceed with litigation or as prescribed by state law, with the assistance KYTC's Office of Legal Services staff.

RAILROAD: PREPARE PARCEL EASEMENT OFFER

Once the railroad agreement is executed, KYTC prepares the parcel easement offer, which must adhere to the railroad company's formatting requirements. Design and ROW project team members coordinate to develop this offer; they receive advisory assistance from Central Office Rails staff.

RAILROAD: REVIEW OF OFFER

Railroad owners can spend a significant amount of time reviewing KYTC's easement offer. In some cases, prolonged reviews may impact the project schedule. Central Office Rails staff who are familiar with railroad review requirements assist the PDT during the iterative review process.

RAILROAD: NEGOTIATIONS/ACCEPTANCE

Easement negotiations follow a review cycle similar to the plan review process. Unfortunately, KYTC's Rails Right of Way staff are not always consulted during earlier plan reviews by the railroad. In response to questions or requests submitted by railroad company personnel, the PM and the Cabinet's rail coordinator revise plans or provide clarification until KYTC's offer is accepted.

Red Flag: Prepare the parcel easement offer as soon as practical so it can be reviewed at the same time as the plan. The ROW offer may be fully reviewed and negotiated before the railroad agreement is executed. If this occurs, the ROW offer will not proceed further until the agreement is executed. The offer resumes where it left off and is executed immediately after the railroad agreement is implemented.

FINAL CONTRACT PLANS & BEGIN LETTING PROCESS

Final Contract Plans are the highway plans awarded through the letting process. Contract Plan Sets are the product of the project development process and consist of the Roadway, Structures, Traffic, and/or Utility Relocation Plans.

The PM or designee includes the following items with the final contract plans submitted to the Central Office Division of Highway Design:

- Final contract plans created and submitted in a full-size PDF pursuant to the latest CAD Standards policy (these become the *Record* plans.)
- A Final Plan Submittal form
- Information needed to create the proposal, including the following, when applicable:
 - CAP Report (even if the CAP has no entries)
 - Final estimate (including all items in the complete contract plans)
 - Project construction schedule (fixed completion date or maximum work days)

- Permit and/or water quality certification
- Utility impact notes
- ROW certification
- Special provisions for protection of railroad interest
- Project-specific special notes or specifications
- Best Management Practices (BMP) documents
- NOI documents
- Supplemental electronic files (delivered via ProjectWise) required by the CAD Standards for Highway Plans
 - Note: Supplemental files are provided to bidders informational purposes only.
- On projects with FHWA oversight, the Project Development Checklist (PDC)

During letting, the Division of Construction Procurement 1) advertises the highway projects, 2) receives bids to complete project work, and 3) awards projects to the low bidder. Each project receives a target letting date; it is KYTC's intention to deliver all projects to letting on time.

Red Flag: Submitting Final Contract Plans on time prevents scheduling problems and delayed lettings. The PM must submit these plans to the Division of Highway Design a minimum of 90 days before lettings that require PS&E and no later than 60 days in advance for all other projects. When submitting Final Contract Plans, the PM must inform the Plan Processing Branch if additional information will need to be inserted into the plans.

ADVERTISEMENT AND QUESTIONS AND ANSWERS FROM THE DIVISION OF CONSTRUCTION PROCUREMENT WEBSITE

The Division of Construction Procurement advertises the letting. The purpose of advertisements is to solicit bids from qualified contractors. They are distributed: 1) not less than 21 days before the opening of bids for Federal-aid projects, or 2) not less than 7 days before the opening of bids for projects that are 100 percent state-funded.

The Division of Construction Procurement's website contains a *Questions and Answers* webpage that publishes official answers to project questions KYTC receives during the letting process. Answers published on this webpage are integrated into the contract between KYTC and the successful bidder. The Division of Construction Procurement forwards project questions submitted during letting to the PM, who then provides an answer. Because the letting process is time-constrained, PMs prioritize the question and answer process and return definitive, accurate answers as soon as possible. To generate sufficient responses, the PM may need to forward some questions to an appropriate SME (e.g. structural, geotechnical, traffic operations). Ultimately, however, it is the PM's responsibility to promptly return clear and informative answers. The PM should also coordinate with Construction and Contract Procurement staff to ensure answers are consistent with the remaining contract documents, including the Standard Specifications for Road and Bridge Construction. If the question and answer process catalyzes revisions of or the insertion of addendums into the bid documents package (e.g., changes to bid quantities and plan sheets), changes must be made quickly so the project letting can proceed according to plan.